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Supreme Court of the United States

OCTOBER TERM, 1974

No. 74-1555

KAISER INDUSTRIES CORPORATION, *et al., Petitioners*

v.

JONES & LAUGHLIN STEEL CORPORATION, *Respondent*

APPENDIX TO PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

VOLUME I—Pages 1-302

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OPINION OF THE COURT BELOW

UNITED STATES COURT OF APPEALS FOR THE THIRD CIRCUIT

No. 74-1312

KAISER INDUSTRIES CORPORATION, *Plaintiff-Appellee*

v.

JONES & LAUGHLIN STEEL CORPORATION,
Defendant-Appellant

KAISER INDUSTRIES CORPORATION,
VEREINIGTE OESTERREICHISCHE EISEN-UND
STAHLWERKE AKTIENGESELLSCHAFT, and
BRASSERT OXYGEN TECHNIK, A.G., *Plaintiffs-Appellees*

v.

JONES & LAUGHLIN STEEL CORPORATION,
Defendant-Appellant

On Appeal from the United States District Court
for the Western District of Pennsylvania

[Entered April 4, 1975]

ADAMS, *Circuit Judge*

Before the landmark case of Blonder-Tongue Laboratories, Inc. v. University of Illinois Foundation[1] was catapulted onto the legal horizon, the rule was that no general collateral estoppel effect attached to a judicial determination of patent invalidity. In *Blonder-Tongue,* the Supreme Court held that a prior adjudication of invalidity may be asserted as a defense to a subsequent attempt to enforce the patent, and that such defense must be accepted unless it is demonstrated that the patentee was denied a full and fair opportunity to litigate in the earlier action.

The plaintiffs here sought to enforce a patent that had been held invalid in a previous suit.[2] The defendant asserted the defense of collateral estoppel, but the district court refused to accept it.[3] Since in the first suit the patentees were afforded a full and fair opportunity to litigate that satisfied the criteria established in *Blonder-Tongue,* we hold that the district court was obliged to accept the defense of collateral estoppel.

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1. 402 U.S. 313 (1971).

2. Henry J. Kaiser Co. v. McLouth Steel Corp., 257 F. Supp. 372 (E.D. Mich. 1966), *aff'd sub nom.* Kaiser Industries Corp. v. McLouth Steel Corp., 400 F.2d 36 (6th Cir. 1968), *cert. denied,* 393 U.S. 1119 (1969) (hereafter *McLouth*).

The entire transcript and record in *McLouth,* briefs from both parties in the district court and in the court of appeals, the appendices in the court of appeals, the opinions from the district court and court of appeals, and the papers requesting and opposing certiorari in the Supreme Court were included in the record of the District Court for the Western District of Pennsylvania to aid in its consideration of the collateral estoppel issue. Appendix Vol. II, 1091-92.

3. In deciding this case, the district court wrote three opinions, entitled Opinion Summary—Collateral Estoppel (1-169); Opinion Compendium—Collateral Estoppel (1-446); and Opinion—The Jones & Laughlin Cases (1-127). The opinions are dated Jan. 29, 1974; each was amended Feb. 11, 1974; judgment was entered Feb. 19, 1974 References are to the typescripts, referred to respectively as Summary, Compendium, and Opinion.

A. The Parties and the Cause of Action

The patent in question,[4] referred to as the Suess patent, is the fundamental United States patent that teaches a process for producing steel by utilizing substantially pure oxygen to react with, and remove, impurities from molten pig iron. The "basic oxygen process," as it is commonly denominated, has been adopted by steel makers throughout the world as a material technological advance over previously available processes for manufacturing steel.

The three plaintiffs in this case control the Suess patent in the United States and indeed throughout the world. They are VOEST,[5] a steel manufacturing company operated by the government of Austria, which presently owns the patent; BOT,[6] a European corporation formed by VOEST, Brassert and others to be the exclusive licensing agent for a group of patents involving oxygen steel production; and Kaiser Industries, the exclusive United States licensee of BOT. The defendant, Jones & Laughlin Steel Corporation, is a major United States steel producer.

Two cases are before the Court: one for royalties, filed by Kaiser in 1961 against Jones & Laughlin for alleged breach of a licensing agreement to use the Suess process at a plant in Aliquippa, Pennsylvania; and another, filed in 1961 by all three plaintiffs, for alleged infringement of the Suess patent by Jones & Laughlin at an unlicensed oxygen steel production plant in Cleveland, Ohio.[6a] The actions were begun in the Northern District of Ohio and removed to the Western District of Pennsylvania. There they were consolidated and tried without a jury. Judgment was for the plaintiffs and defendants appealed.

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4. United States patent 2,800,631, issued July 23, 1957.

5. Vereinigte Oesterreichische Eisen-Und Stahlwerke Aktiengesellschaft (VOEST).

6. Brassert Oxygen Technik, A.G. (BOT). A third partner, OAM, Oesterreichisch-Alpine Montangesellschaft, is not directly involved in the present dispute.

6a. Jurisdiction is founded on 28 U.S.C. §§ 1332(a)(1), 2201, 2202, and 35 U.S.C. §§ 271, 281.

In light of our disposition of the over-arching issue of collateral estoppel, we need not address the other contentions presented, such as the patent's validity and the alleged infringement.

B. Steel Refining and the Advent of the Oxygen Process

Reducing steel making to its essentials, iron is converted into steel via a two-step transformation.[7] In the first stage of the operation, the oxides contained in the iron ores are removed and the ore is reduced to pig iron. This process, known as smelting, is performed in a blast furnace.

It is the second step of the steel making operation, refining, that forms the backdrop for this litigation. The pig iron includes various chemical impurities, such as phosphorus, carbon, silicon, manganese and sulphur. Refining is directed to lowering the amounts of the impurities in the pig iron to levels congruent with desirable steel qualities, while at the same time avoiding the introduction into the steel of additional impurities such as nitrogen or oxides.

Several methods have been employed in modern times for the conversion of pig iron into steel.[8] The most efficient technique presently available for refining steel is the basic

7. Instructive historical synopses of the steel making process may be found in the district court Compendium, 15-23, and in its Summary, 6-18. *Also see McLouth*, 257 F. Supp. at 377-80, 400 F.2d at 38-40.

8. First there was the Bessemer-Thomas process, developed in the 1850's, in which air is blown through a series of inlets or tuyeres in the bottom of a vessel containing molten pig iron. The contaminants selectively react with the oxygen that is in the air, and the impurities rise to the surface, to form a slag layer, or to go off into the air as carbon monoxide or carbon dioxide. Several limitations made the Bessemer-Thomas process far from ideal: nitrogen from the air was not excluded from the final steel product; excessive quantities of phosphorous or sulphur might remain; and complications entailed in the process made it costly and inefficient. Bessemer-Thomas refining has virtually disappeared from modern steel making.

The open hearth process, initially employed in the 1880's, uses a large furnace fired by oil or gas as the locus of refining. The open hearth method produced high calibre steel. Its drawbacks were the need for large amounts of capital, high operating costs, a slow refining rate, and a relatively low production capacity per furnace. The open hearth process dominated in steel manufacturing before the advent of the basic oxygen process, accounting for approximately 90% of steel production in the United States in the 1950's.

A third refining process, involving the electric furnace, is used very seldom for general commercial purposes because of its high production costs. *See* note 9, *infra*.

oxygen process, which jets a stream of high purity oxygen downward from above the surface of the molten metal bath. As practiced commercially, the advantages of the basic oxygen process are substantial. The resulting product is high quality steel, with low and controllable phosphorous and nitrogen content. And the steel can be rapidly manufactured in large batches, with relatively low capital and operating costs.

The remarkable success of the oxygen technique of steel refining is evidenced by the swift expansion of the industrial capacity for producing such steel. Most newly constructed facilities for the manufacture of steel adopt the basic oxygen method. The percentage of total steel produced by this process in the United States rose rapidly after the early 1960's, and by 1970 oxygen steel production accounted for more tons of raw steel produced in the United States than the open hearth process.[9]

Initial efforts to refine steel utilizing pure oxygen forcefully propelled from above the bath surface were patented in Germany in 1943 by Schwarz,[10] and in Belgium, Britain and France, shortly thereafter, by Miles.[11] However, the specific techniques taught by Schwarz and Miles were never exploited commercially.

Experiments in Austria in 1949 produced superior results under a modified version of prior oxygen steel making. The Austrian experiments were conducted under the aegis of VOEST, a plaintiff in this case. In contrast to the earlier schemes, that taught deep penetration of the oxygen stream into the bath, the Austrians employed an

9. These undisputed facts and statistics on steel making processes are derived from evidence submitted below, from the Opinion of the Western District Court, 25-26 (whose data sources are the 1967 Minerals Year Book, Bureau of Mines, U.S. Dept. of Interior, and a report by the American Iron & Steel Institute), and from the district court opinion in *McLouth*, 257 F. Supp. at 378-79.

10. German patent No. 735,196, issued July 3, 1943, granted to Schwarz' employer, H. A. Brassert & Co.

11. Belgian patent No. 468,316, issued November 30, 1946; British patent No. 642,084, issued August 30, 1950; French patent No. 983,096, issued April 9, 1948.

oxygen jet of more moderate force, so that the oxygen did not penetrate so deeply into the bath. Under the new process, the oxygen, hitting on the center surface of the bath, reacts with impurities in the area of impact. The oxidized manganese and phosphorous leave the bath and float up into the slag layer that is created. The carbon monoxide that is produced by the process, however, is believed to form minute explosive bubbles that are driven downward toward the bottom of the vessel. Great heat is generated by the exothermic reactions at the point of oxygen contact, and a thermally induced circulation occurs inside the bath. The general circulation pattern is described as downward in the bath center, and around and upward along the sides of the hemispheric vessel. Because of the circulation pattern, unreacted portions of the bath are constantly exposed to the oxygen reaction area. The locally evolved heat at the reaction center is dissipated and absorbed in secondary, endothermic reactions along the sides of the refractory vessel.

On occasion, various elements of the multi-faceted physical-chemical Suess process have been singled out as the essence of the invention. However, in order to distinguish the Schwarz and Miles patents that teach that oxygen should be blown deep into the molten metal bath, emphasis has been consistently placed on avoidance of deep penetration by the oxygen stream, and the chemical and physical effects that flow therefrom.[12]

C. Patenting the Suess Process

After developing the concept of an oxygen jet of moderate force, the Austrians proceeded to seek patent

12. 400 F.2d at 49: "Appellants [Kaiser et al.] have insisted throughout this case that they regard the subject matter of the patentees' invention to be 'avoidance of deep penetration.'" In their brief to the Sixth Circuit in *McLouth*, the same plaintiffs argued that the gist of the invention, avoidance of deep penetration, was the concept that the patentees intended to protect.

Plaintiffs have continued to acknowledge in the present case that avoidance of deep penetration by the oxygen jet is the critical nub of their invention. Plaintiffs' brief 8, 9, 13-14. *See also*, Suess continuation-in-part application, Nov. 1954, U.S. Patent Office; Drs. Hauttmann & Rinesch, affidavits, U.S. Patent Office.

protection. However, to avert conflict with the rather similar Schwarz patent, owned by Brassert, and in order profitably to commercialize the basic oxygen process, VOEST and Brassert in 1952 formed an exploiting firm, the plaintiff BOT. By agreement, BOT acquired exclusive rights to license oxygen steel making patents controlled by either of the partners. Pursuant to the plan of the parties, BOT licensed plaintiff Kaiser in 1954 as its sole licensee in the United States. Once the United States patent for the Suess process was secured, rights under the Austrian process thus accrued to Kaiser.[13]

The original filing for the United States patent that forms the basis for the present suit was by Suess, in 1951. Suess applied for the patent in his own name and designated himself as sole inventor. However, in 1955, VOEST succeeded to the world-wide patent rights of Suess, and both BOT and Kaiser thereby acquired a derivative interest in any United States patent that issued to VOEST on the basic oxygen process developed by Suess. A short time later, three Austrian co-workers of Suess, Drs. Trenkler, Rinesch and Hauttmann, were included in the patent application as co-inventors of the process.

The Suess application followed a labyrinthian course through the United States Patent Office, only a limited portion of which is relevant here. Ultimately, the 1951 claims and specification were definitively rejected by the Patent Office and abandoned by the plaintiffs.[14]

A continuation-in-part application covering the same invention was filed November 16, 1955. The specification of the continuation application contained a more particu-

13. In the course of this opinion, reference to Kaiser is intended to incorporate the other plaintiffs wherever appropriate.

14. 35 U.S.C. § 112 (1954) requires that a patent specification:

> contain a written description of the invention, and the manner and process of making and using it, in such full, clear, concise and exact terms as to enable any person skilled in the art to which it pertains . . . to make and use the same. . . .
>
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

larized discussion of the procedures to be followed in practicing the basic oxygen method. It concluded with fifteen new claims, the first four advocating, as a critical element in the invention, the avoidance of deep penetration by the oxygen jet. All the new claims were rejected by the Patent Office on June 14, 1956, because the claimed invention was covered by prior patents, including the Miles patent and an early Brassert patent.[15] The patentees thereupon amended the application on December 7, 1956, cancelling claims 1 through 10, resubmitting claims 11 through 15 with only minor changes, and adding claim 16, incorporating the concept of avoidance of deep penetration. Documentation accompanying the modified submission distinguished the Miles patent "in the very important particular of depth of penetration" by the oxygen jet. It continued,

> [We are] emphasizing a much lower impingement pressure and a practically negligible penetration of the surface of the molten metal by the oxygen jet. As pointed out at length in the specification . . . it is of utmost importance . . . to avoid deep penetration of the molten metal by the oxygen or air blast.[16]

The claims were totally revised on June 11, 1957. The patentees advised the Patent Office: "The claims of the application are cancelled and new claims No. 17 and No. 18 are substituted therefor in view of the discussion with the [Patent Office] examiner on May 1, 1957. . . . The new claims are believed to be properly definitive of the invention."[17] The two new claims do not by their terms advert to the depth of penetration by the oxygen jet. However, accompanying the new claims were affidavits from two of

15. The Cuscoleca patent, U.S. No. 2,741,555, issued April 10, 1956, was also a basis for the Patent Office rejection of the continuation-in-part claims. Cuscoleca, also held by the plaintiffs, appears to have teachings quite similar to the Suess patent. Despite its having been filed subsequent to Suess, Cuscoleca issued earlier. Cuscoleca is not directly involved in the present litigation.

16. Plaintiffs' Exhibit 2-A, Patent Office File Wrapper of Suess patent.

17. *Id.*

the inventors, Drs. Rinesch and Hauttmann, that did discuss the question of oxygen penetration and expanded generally on the experimental and theoretical background of the basic oxygen process. No alterations were made in the specification when the new claims were filed.

On June 17, 1957, six days after the new claims were filed, and following a final conference with the Examiner that took place on June 14, 1957, one minor amendment was inserted in the first new claim. This amendment rendered the patent application acceptable to the Patent Office. As a result, the application was allowed on June 27, 1957, and the Suess patent was issued July 23, 1957.[18]

The specification in the patent that issued described a process whereby steel was refined by using a high speed jet of pure oxygen directed vertically downwards onto a bath of molten metal, through an early-formed slag layer, in a manner so as to *avoid deep penetration* of the metal bath by the oxygen. The patent claims did not mention the avoidance of deep penetration. Instead, the claims read as follows:

> 1. Method of refining molten impure iron in the presence of a slag in a vessel having a refractory lining by blowing with oxygen, which comprises discharging a stream of oxygen vertically downwardly through the slag layer onto and below the surface of the bath at the central portion thereof, to an extent to *avoid material agitation* of the bath by the oxygen stream, the contact of the oxygen with the bath resulting in reaction of the oxygen with a portion of the iron and with the oxidizable impurities of the bath in a localized reaction zone spaced a substantial distance from the refractory lining, the reactions in said zone resulting in refining of the iron and gas evolution and in the production of high temperature in the reaction zone away from the refractory lining, said reaction producing a circulatory

18. A more extended discussion of the proffered claims and their reception by the Patent Office may be found in *McLouth*, 400 F.2d at 52-55.

movement in the molten metal, which circulatory movement brings those portions of the molten metal bath which are remote from the reaction zone into the reaction zone whereby those portions are subjected to said reaction with minimum injury to the refractory lining.

2. The gaseous oxygen process set forth in claim 1 in which the oxygen is blown into said vessel under pressure in a range between about five and about twenty-five atmospheres above normal atmospheric pressure. (emphasis added).

D. Litigation Respecting the Suess Patent: The McLouth Case

Several years prior to the issuance of the Suess patent, McLouth Steel Corporation, a United States manufacturer, sent representatives to confer with the Austrians. McLouth resolved to integrate the new oxygen process in its facility then being developed. Accordingly, McLouth entered into a contract with Kaiser in November, 1954, under which Kaiser would give advice and assistance to McLouth.

1. *Proceedings in the Michigan District Court.*

After McLouth's oxygen steel-making plant was in production, Kaiser determined that McLouth was conducting an unlicensed infringing operation. Consequently Kaiser, together with VOEST and BOT, brought suit in the Eastern District of Michigan on July 19, 1957, four days before the Suess patent issued, claiming infringement of the Cuscoleca patent, which plaintiffs also control.[19] A subsequent amendment to the complaint substituted the Suess patent for the Cuscoleca patent.[20]

19. *See* note 12, *supra*.

20. The Suess patent has been the subject of litigation practically from its date of issue. In Kaiser Industries Corp. v. Wheeling-Pittsburgh Steel Corp., 328 F. Supp. 365 (D. Del. 1971), reference is made to the existence of ten

McLouth admitted the use of the Austrian process, but predicated its defense on the assertion that, for a variety of reasons, Kaiser did not possess an enforceable patent. Among its contentions, McLouth attacked the Suess patent process as anticipated by prior art, specifically by the Schwarz and Miles patents,[21] and as obvious to one skilled in the art at the time of the invention.[22] McLouth also asserted that the patentees had not invented the process.[23] Additionally, McLouth urged invalidation of the Suess patent because of indefiniteness, alleging that neither the claims nor the specification of the Suess patent satisfied the statutory requirements embodied in 35 U.S.C. § 112, and contending that the specification did not support the claims of the Suess patent.

The district court proceedings in *McLouth* were prodigious, and characterized by the district court in that case as follows:

> The litigation has been unusually long and complex. After several years of pretrial research, experimentation and discovery, the case came to trial in October, 1963. Trial of the case required 150 days of court time, spread over an entire calendar year. More than 13,800 pages of testimony were taken, consisting largely of scientific evidence, much of which required the use of interpreters. A great number of exhibits were received in evidence, including large testing equipment, test pieces, and many demonstration movie films, as well as a considerable volume of documentary evidence. At the conclusion of the trial, briefs were

20. (Cont'd.)
suits—in addition to the *McLouth* and *Jones & Laughlin* cases—involving the Suess patent. At oral argument it was stated, without objection, that a number of the cases have been consolidated and that further proceedings have been stayed pending the determination of this case. At oral argument it was also indicated that unpaid royalties and damages for infringement under the Suess patent exceed one billion dollars.

21. Anticipation constitutes a patent defense under 35 U.S.C. § 102 (1954).

22. Obviousness constitutes a patent defense under 35 U.S.C. § 103 (1954).

23. Lack of inventorship constitutes a patent defense under 35 U.S.C. § 102(f) (1954).

> prepared and submitted by the parties, totaling nearly 1000 printed pages. Final arguments lasted five days. . . . The testimony and documentary exhibits in [bound] form occupy approximately [equal amounts] of library shelf space, totaling more than twelve feet.[24]

In addition to the evidence received in the form of expert testimony and documents, the Michigan district judge undertook a site visit to the McLouth plant. He also witnessed a series of experiments in a University of Michigan metallurgy laboratory.

The conclusions of the Michigan district court were announced in an opinion of 70 printed pages filed July 16, 1966.[25] The court accorded appropriate recognition to the statutory presumption of patent validity,[26] and to the heavy burden of proof on one who would overcome a patentee's rights under the Constitution and statutes. The basic oxygen process patented by Suess was determined to confer "substantial advantages [which] . . . quickly became apparent."[27] "The remarkable success of the [basic oxygen process was] dramatically illustrated"[28] by statistics relating to recent steel plant construction and annual capacities. The Michigan district court expressed the view that revolutionary patents such as Suess merit a liberal construction.[29]

Attacks on the patent's validity were addressed seriatim by the Michigan court. After a careful discussion, it found unpersuasive McLouth's contentions that the Suess patent was anticipated by prior art, was obvious, lacked inventorship, and that the specification did not satisfy the statute.

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24. 257 F. Supp. at 377, note.

25. *Supra* note 2.

26. 35 U.S.C. § 282 (1959). Trio Process Corp. v. L. Goldstein's Sons, Inc., 461 F.2d 66 (3d Cir.), *cert. denied* 409 U.S. 997 (1972).

27. 257 F. Supp. at 398.

28. *Id.* at 399.

29. *Id.* at 441-42. This Circuit adheres to the same rule of interpretation. Corning Glass Works, Inc. v. Anchor Hocking Glass Corp., 374 F.2d 473 (3d Cir. 1967), *cert. denied* 389 U.S. 826 (1967).

The Michigan court then turned to a consideration whether the *claims* of Suess satisfied section 112. Section 112 provides in pertinent part:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

In this regard the Michigan court determined that there were three statutory mandates that had not been met and that, therefore, the Suess patent was void for indefiniteness.

First, it ascertained that the claims of the patent do not properly measure the invention:

> [T]he avoidance of deep penetration is clearly the subject matter which applicants regarded as their invention, and yet the concept of the avoidance of deep penetration simply cannot be read into the claims of the patent in suit. The language of the claims admittedly does not refer expressly to the avoidance of deep penetration of the bath by the jet, nor can any language of the claims be construed to contain such a meaning.[30]

In response to the assertion, pressed vigorously by Kaiser, that the claim language, "avoid material agitation," incorporated the notion of avoidance of deep penetration, the Michigan court gave its reasons for being unable to find a causal relationship between the key terms "agitation" and "penetration." Undeniably, no causal relationship was defined within the four corners of the patent. In addition, as a logical proposition it appeared to the Michigan court "that even deep penetration would avoid material agitation as defined by plaintiffs."[31]

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30. *Id.* at 426 (reference omitted).

31. *Id.* at 426.

Supplementing the foregoing grounds of decision, the Michigan court found "a further reason why the actual invention of the patentees cannot be read into the claims of the patent in suit."[32] The Patent Office had earlier been presented with claims by Suess that expressly identified "avoidance of deep penetration" as an "essential feature" of the invention. These claims were rejected by the Patent Office and later cancelled by Suess. The Michigan court found that the applicant acquiesced in the Patent Office rejection of the claim, "the cancellation of which amounts to a disclaimer."[33]

The Michigan court held that the patentees were bound by their choice to submit an alternative description rather than to appeal the rejection. The conclusion of the Michigan court was based on Schriber-Schroth Co. v. Cleveland Trust Co., where the Supreme Court expounded the doctrine of file wrapper estoppel:

> It is a rule of patent construction consistently observed that a claim in a patent as allowed must be read and interpreted with reference to claims that have been cancelled or rejected and the claims allowed cannot by construction be read to cover what was thus eliminated from the patent. . . .[34]

The second issue under section 112 was whether the patent claims found support in the specification. The Michigan court applied the "well-established principle of patent law that the claims of a valid patent must be supported by the specification."[35] Here again, the Michigan court found the patent wanting, since several steps of the claims were not defined or described adequately in the specification.

32. *Id.*

33. 257 F. Supp. at 427, quoting Schriber-Schroth, 311 U.S. 211, 220 (1940), and relying on Smith v. Magic City Kennel Club, Inc., 282 U.S. 784 (1931) and Leggett v. Avery, 101 U.S. 256 (1879).

34. 311 U.S. 211, 220-221 (1940).

35. 257 F. Supp. at 428. Schriber-Schroth Co. v. Cleveland Trust Co., 305 U.S. 47 (1938).

In particular, the Michigan court could discover no support in the specification for any reasonable interpretation of the claim language, "to avoid material agitation of the bath by the oxygen stream." The court undertook a careful review of relevant legal precedent, of the exact language of the claims and the specification of the patent, and of expert testimony. It painstakingly considered Kaiser's contention that the specification did in fact teach the subject of the claim.

However, the Michigan court concluded from the evidence that the notion of material agitation *by the oxygen* "is a fiction,"[36] because the violent chemical reactions taking place occasioned so much agitation that no effect from the oxygen was discernible. Furthermore, experts did not appear to understand what the claim language meant. While the language used in the specification, "avoidance of deep penetration," was perhaps a claimable invention, the court was unable to locate any teaching in the specification that would correlate the concept disclosed in the specification (avoidance of deep penetration) to the concept claimed (avoidance of material agitation). Nor, the Michigan court found, would such a relationship be apparent to those skilled in the art.

As an additional reason for not reading the specification to fulfill the language of the claim, the Michigan court again expressed its understanding that it was bound by the doctrine of file wrapper estoppel. Under the file wrapper doctrine, it held, the language that had been cancelled from a claim could not be reinserted in an allowed claim by the process of interpretation.

By a similar analysis, the Michigan court found no support in the specification for the claim language of a chemical "reaction producing a circulatory movement in the molten metal" or that the oxygen was to be blown "below the surface."

36. 257 F. Supp. at 433.

There was yet another ground in *McLouth* for disallowing the patent claims under section 112. Contrary to the requirements of patent law, the Michigan court held, the claims are not restricted to the invention since they cover prior art. "[Because of the] broad scope of the claims, . . . even a person practicing the prior art would infringe the process of the claims."[37]

In capsule form, the Michigan court found the Suess patent invalid under section 112 on three independent grounds: the claims did not measure the invention, the claims were not supported by the specification, and the claims covered prior art. In the course of its opinion, the Michigan court mentioned that it was unfortunate that the patentees had not pursued more insistently their original claims, advocating avoidance of deep penetration, since such claims appeared more likely to form the basis of a valid patent.

2. *Proceedings in the Sixth Circuit.*

The judgment of invalidity based on the opinion by the Michigan court was appealed to the Sixth Circuit. The four points argued by Kaiser to the Sixth Circuit were (1) whether the doctrine of file wrapper estoppel precluded a construction of the Suess claims incorporating the concept of avoidance of deep penetration; (2) whether the claims defined the invention sufficiently to satisfy section 112; (3) whether the claims were adequately supported by the specification; and (4) whether the claims over-reached so as to cover prior art.[38]

As to the file wrapper estoppel, the sole contention pressed by Kaiser in the Sixth Circuit was that the Michigan district court had misconstrued the doctrine. Kaiser argued to the Sixth Circuit, "The doctrine of file wrapper estoppel has no application in those cases where nothing

37. *Id.* at 439. For this proposition the Michigan court cited cases including United Carbon Co. v. Binney & Smith Co., 317 U.S. 228 (1942); Huntman Stabilizer Corp. v. General Motors Corp., 144 F.2d 963 (3d Cir. 1944).

38. A cross-appeal was taken by McLouth on the issues of obviousness and inventorship.

has been surrendered by the applicant to get his patent or where, as here, there was a mere rephrasing of the claims in an effort to put them into more apt language. . . ."[39] Kaiser, asserting that avoidance of deep penetration was and always had been considered the gist of the patentee's invention, took the position that it had never abandoned this concept during the Patent Office proceedings. No argument was advanced that Kaiser was unaware that the file wrapper estoppel question would arise in the Michigan court, and was therefore deprived of an opportunity to present evidence on such issue.

The Sixth Circuit filed its opinion affirming the Michigan court on August 2, 1968. It expressly approved the manner in which the district court had conducted the trial:

> The handling of the protracted trial on infringement by the District Judge was a monumental task, which he performed ably and well. . . .[40]

Although it declined to embrace every determination by the trial court, the Sixth Circuit concluded that the Suess patent was invalid because the claims did not particularly and distinctly claim the invention described in the specification.[41] Further, the Sixth Circuit upheld the district court's conclusion that the language actually used in the claim—avoid material agitation—"had no meaning to one skilled in the art."[42] Finally, the Sixth Circuit held that the claim reached impermissibly beyond the invention, to encompass prior art. It viewed such a claim as an improper attempt to extend a patent monopoly, and stated that the remedy for such an attempt would be to invalidate the patent.[43]

39. Kaiser, Brief on appeal to the Sixth Circuit in *McLouth*, at 26.

40. 400 F.2d 36, 38 (6th Cir. 1968).

41. United Carbon Co. v. Binney & Smith Co., 317 U.S. 228 (1942). *See infra* note 88.

42. 400 F.2d at 54.

43. Grave doubts were raised by the Sixth Circuit regarding the correctness of the district court's holding that the invention was not obvious. However, the case was not remanded for further findings on this point because of the ultimate holding of invalidity on other grounds.

Two members of the Sixth Circuit panel found that file wrapper estoppel would preclude a court from reading the phrase "avoid deep penetration" into the claim of the Suess patent. Relying on *Schriber-Schroth*[44] the majority held:

> We believe that sound inferences can be drawn from the Patent Office's rejections of earlier claims which contained the element of avoidance of deep penetration and its reference to the Cuscoleca Patent. Although the record is void as to the content of the discussion with the Examiner on May 1, 1957, we believe that an inference of abandonment can be drawn from the omission of 'avoidance of deep penetration' from the final claims. In our opinion, if the element was as important as the affidavits imply, it would have been explicitly included in the claims; the Patentees were well aware that our patent laws require that the claims 'distinctly' claim the alleged invention. The appellants cannot regain the phrase or qualify the effect of their acquiescence through the affidavits. Parke, Davis & Co. v. American Cyanamid Co., 207 F.2d 571, 574 (6th Cir. 1953). In the face of prior rejections, the claim allowed, cannot, by construction or affidavit, be read to cover that which was specifically abandoned by the patentee so as to give the allowed claim a scope it might have had without the omission of the language.[45]

With regard to the factual determination whether the patentees abandoned their claim of deep penetration, the court of appeals expressed the view that "abandonment is established if a phrase used in an abandoned or rejected claim is not used in a later accepted claim."[46]

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44. 311 U.S. at 220. Smith v. Magic City Kennel Club, Inc., 282 U.S. 784 (1931); Exhibit Supply Co. v. Ace Patents Corp., 315 U.S. 126 (1942).

45. 400 F.2d at 54.

46. *Id.* at 55.

The third judge on the Sixth Circuit panel joined the opinion in all respects except that portion dealing with file wrapper estoppel. His determination of patent invalidity was based flatly on the failure of the patentee's claims to satisfy the definiteness requirement of section 112.

A petition for certiorari posing, inter alia, the question whether the file wrapper estoppel issue was correctly decided, was denied by the Supreme Court March 3, 1969.[47]

E. Litigation Respecting the Suess Patent: Proceedings in the Western District Court.

After several years of pretrial proceedings, the trial of this case for contract royalties and patent infringement began in the District Court for the Western District of Pennsylvania, on October 23, 1967. It continued with some interruptions until its conclusion on March 14, 1968.

In the period between trial and decision the record in the Western District of Pennsylvania was twice re-opened. In September, 1969, the district court granted a motion by plaintiffs to open the record in order to submit evidence relating to file wrapper estoppel.[48] The following April, there was filed a deposition by the Patent Office Examiner who had been responsible for final approval of the Suess patent. Also, testimony was received from the patentees' attorney, who had been present at the May 1, 1957 interview at the Patent Office that had preceded the claim revision. The attorney testified that, consistent with Patent Office policy favoring positive formulations, the substitution of the claims just prior to issuance was intended to convey a

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47. 393 U.S. 1119 (1969). In the petition for certiorari, Kaiser did not contend that it was foreclosed from an adequate opportunity to present evidence on the file wrapper estoppel point. Rather, it claimed the Sixth Circuit had erred as a matter of law as to the file wrapper estoppel.

48. This motion was presented to the court below eighteen months after trial had concluded, some three years after the district court decision in *McLouth*, over a year after the Sixth Circuit affirmance, and six months after the denial of certiorari in that case. The suggested reason for reopening the record was to fill an alleged "void" in the record of *McLouth*, *see* text at n.45, *supra*, since Kaiser wished to combat the inference of abandonment of its original claim language. The Western District Court noted, however, that it disputed the existence of such a void. Summary 120. Compendium 403.

more positive concept of localized penetration, in preference to the negative language, namely, "avoidance of deep penetration."[49] He alleged that there had been no intention to abandon the concept of avoidance of deep penetration, and that the change in words did not reflect an abandonment of the theory of the invention.

A second re-opening occurred the following year, in 1971, when *Blonder-Tongue*[50] was announced by a unanimous Supreme Court. As previously indicated, *Blonder-Tongue* decreed that the defendant in a patent infringement action may assert a plea of collateral estoppel based upon a final determination of patent invalidity in a prior infringement case brought by the patentee, even though the earlier suit was against a different party.

The watershed decision in *Blonder-Tongue* radically altered the posture of the present case, then pending before the Western District Court. It became incumbent on that court to ascertain the collateral estoppel effect of the *McLouth* determination. Additional hearings and argument were scheduled in September, 1971 regarding the import of *Blonder-Tongue* and the file wrapper estoppel issue. Witnesses included the former Commissioners of Patents and other experts in Patent Office practice.

Final argument was heard in December, 1971. In January, 1974, the Western District Court decided the case in three comprehensive opinions totaling nearly 800 pages.[51] These opinions are devoted in substantial measure to the collateral estoppel question. The Western District Court concluded that *Blonder-Tongue* did not require that it accept the defense of collateral estoppel in the situation presented. To assess the correctness of the determination of the Western District Court in this respect, it is necessary to examine in detail the rule announced in *Blonder-Tongue*.

49. As the Western District Court observed, it is somewhat difficult to perceive in what way the final claim language, "avoid material agitation," is more positive than the cancelled language, "avoid deep penetration." Compendium 66-67.

50. 402 U.S. 313 (1971).

51. *See* note 3 *supra*.

F. The Blonder-Tongue Decision.

In *Blonder-Tongue*[52] the Supreme Court partially overruled the holding of Triplett v. Lowell[53] and in the context of actions for patent infringement jettisoned the rule that "the estoppel of a judgment must be mutual."[54] The Court unanimously held that, where a patent had been declared invalid in a prior adjudication, an unrelated defendant in a subsequent action for infringement may assert a collateral estoppel defense based on the previous judgment.[55] In reaching its decision, the Supreme Court discussed at length the singular qualities of patents, and the special characteristics of patent litigation. The outcome was the creation of a pragmatic formula that harmonized considerations of due process and judicial economy. It was aimed at producing substantial justice while avoiding needlessly repetitious litigation.

The Supreme Court considered and rejected the notion that patents were per se so complex that a rule permitting infinite litigation of patent validity was required. Many of the issues involved in deciding questions of patent validity, it was stated, do not require any scientific training to

52. 402 U.S. 313 (1971). The mutuality doctrine had long been criticized; both state courts and lower federal courts had eliminated mutuality as a requisite for collateral estoppel in many nonpatent areas of law. *E.g.*, Bruszewski v. United States, 181 F.2d 419 (3d Cir. 1950), *cert. denied*, 340 U.S. 865 (1950); Zdanok v. Glidden Co., 327 F.2d 944 (2d Cir. 1964), *cert. denied* 377 U.S. 934 (1964); Bernhard v. Bank of America, 19 Cal. 2d 807, 122 P.2d 892 (1942).

53. 297 U.S. 638 (1936). An early case establishing the basic elements of collateral estoppel, that included mutuality, is Cromwell v. County of Sac, 94 U.S. 351 (1876).

54. Bigelow v. Old Dominion Copper Mining & Smelting Co., 225 U.S. 111, 127 (1912), quoted in *Blonder-Tongue*, 402 U.S. at 321.

55. A prior ruling could not ordinarily be asserted against a non-party, consistent with current understanding of due process. *E.g.*, Philips Electronic & Pharm. Ind. v. Thermal & Electronics Ind., 450 F.2d 1164 (3d Cir. 1971) (patentee cannot assert *Blonder-Tongue* estoppel where first adjudication results in finding of validity).

Critics have admonished the courts lest the collateral estoppel doctrine be expanded improvidently. Due process considerations must, they argue, prevail over the interests of judicial economy. *See*, Semmel, Collateral Estoppel, Mutuality and Joinder of Parties, 68 Colum. L. Rev. 1457 (1968); Currie, Civil Procedures: The Tempest Brews, 53 Calif. L. Rev. 25 (1965); Moore & Currie, Mutuality and Conclusiveness of Judgments, 35 Tul. L. Rev. 301 (1961).

resolve. Even in complicated patent cases, the Court noted, there is no reason to expect that further litigation will produce a better result than the initial determination.

In justifying use of the estoppel defense against a patentee by an unrelated defendant, the Court emphasized that the patentee in *Blonder-Tongue* had enjoyed both the initiative and incentive in the prior litigation. The patentee in *Blonder-Tongue* had been plaintiff in the first case,[56] and thus chose the party to sue and determined the time and place of the litigation. These elements are also found in the present case. The plaintiffs here, Kaiser, BOT and VOEST, took the initiative in *McLouth* and made the decision when and where to file suit.

Additionally, mindful of the deliberate nature of patent litigation, and the high stakes that can turn on a question of patent validity, the Supreme Court in *Blonder-Tongue* cautioned:

> Presumably [the patentee] was prepared to litigate and to litigate to the finish against the defendant there involved. . . . [T]here is no reason to suppose that plaintiff patentees would face either surprise or unusual difficulties in getting all relevant and probative evidence before the court in the first litigation.[57]

It cannot reasonably be maintained that there was a want of incentive for a vigorous litigation in the *McLouth* case. First, the action involved very substantial amounts of money. Second, even under the mutuality requirement of *Triplett*, there were potential collateral estoppel effects. The McLouth company itself, for instance, could open new steel plants that utilized a process covered by the Suess patent. In any infringement action brought by Kaiser regarding such subsequent plants, the parties and the issue of patent invalidity would be the same as in the first

56. University of Illinois Foundation v. Winegard Co., 271 F. Supp. 412 (S.D. Iowa 1967), *aff'd* 402 F.2d 125 (8th Cir. 1968), *cert. denied* 394 U.S. 917 (1969).

57. 402 U.S. at 332.

McLouth case. The holding of patent invalidity from the first *McLouth* case, therefore, would provide a successful collateral estoppel defense to *McLouth* in such later suits. Since nearly all new steel manufacturing installations were then adopting the basic oxygen process, this hypothesis is not unrealistic. We are therefore persuaded that Kaiser had adequate incentive to litigate fully in the *McLouth* case.

In the initial trial of the patent at issue in *Blonder-Tongue*, the plaintiff, having lost in the district court after a disposition on the merits, appealed to the court of appeals. That court affirmed and the plaintiff petitioned unsuccessfully for certiorari on the question of patent validity. This procedural history contributed to the Supreme Court's conclusion that the previous patent trial had been diligently pursued "to the finish." The litigation in *McLouth* followed a parallel course procedurally. And there can be no doubt that the *McLouth* litigation was also "to the finish."

Consequently, we conclude that, from the standpoint of initiative in bringing suit, incentive to litigate, and full exercise of appellate rights, *McLouth* is essentially identical with the original case reviewed in *Blonder-Tongue*.

However, even where a defense of collateral estoppel may be appropriately raised, the Supreme Court did not mandate its unqualified acceptance. Instead, under *Blonder-Tongue*, before collateral estoppel is determined, the patentee must be allowed "to demonstrate, if [it] can, that [it] did not have 'a fair opportunity procedurally, substantively and evidentially to pursue [its] claim the first time.' "[58]

Under the Supreme Court holding, the correctness of the result of the earlier patent suit is not at issue.[59] In-

58. 402 U.S. at 333, *quoting* Eisel v. Columbia Packing Co., 181 F. Supp. 298, 301 (D. Mass. 1960).

59. Blumcraft v. Kawneer Co., 482 F.2d 542 (5th Cir. 1973); Sampson v. Ampex Corp., 478 F.2d 339 (2d Cir. 1973); University of Illinois Found'n v. Blonder-Tongue Lab., Inc., 465 F.2d 380 (7th Cir. 1972), aff'g 334 F. Supp. 47 (N.D. Ill.). There is not unanimity on this matter, however. *See* 49 N.Y.U. L. Rev. 343 (1974).

deed, the sole ground explicitly recognized by the Supreme Court to defeat a motion for summary judgment made in the second case and premised on *Blonder-Tongue* is that the first adjudication did not provide a "full and fair opportunity to litigate."

The Supreme Court set forth criteria to guide the second trial court in its determination whether to reject the defense of collateral estoppel:

> Determining whether a patentee has had a full and fair chance to litigate the validity of his patent in an earlier case is of necessity not a simple matter. In addition to the considerations of choice of forum and incentive to litigate mentioned above, certain other factors immediately emerge. For example, if the issue is non-obviousness, appropriate inquiries would be whether the first validity determination purported to employ the standards announced in *Graham v. John Deere Co.*, [383 U.S. 1 (1966)]; whether the opinions filed by the District Court and the reviewing court, if any, indicate that the prior case was one of those relatively rare instances where the courts wholly failed to grasp the technical subject matter and issues in suit; and whether without fault of his own the patentee was deprived of crucial evidence or witnesses in the first litigation. But as so often is the case, no one set of facts, no one collection of words or phrases, will provide an automatic formula for proper rulings on estoppel pleas. In the end, decision will necessarily rest on the trial courts' sense of justice and equity.[60]

The guidelines suggested for reaching a result permitting relitigation are replete with qualifying words making a patentee's burden onerous. In effect, a patentee must persuade a second trial court "that the prior proceedings were seriously defective."[61]

60. 402 U.S. at 333-34 (citations omitted).

61. 402 U.S. at 333.

After enumerating particular factors, the Supreme Court stated that the decision whether to adopt the estoppel defense is entrusted finally to "the trial courts' sense of justice and equity." We do not interpret the phrase "justice and equity" to constitute a departure from the exacting language used by the Supreme Court earlier in the same paragraph of its opinion.[62] Rather, the phrase indicates that each case merits individual consideration before a district court rules on an estoppel plea and, possibly, that other extraordinary grounds, not expressly mentioned, may provide the necessary foundation for denying a collateral estoppel defense in individual cases.

It is suggested by Kaiser that generalized concepts of justice and equity constitute an independent ground for denying an estoppel defense, and that a determination whether such independent ground exists should rest in the discretion of the trial court. We cannot acquiesce to a meaning of the words "justice and equity" that would permit unarticulated and unreviewable determinations when a district court refuses a plea of collateral estoppel in patent litigation.

Courts have on several occasions been presented with particular factual circumstances that patentees contended justified relitigation on grounds of justice and equity. Most such situations could be comprehended under a broad interpretation of the concept of a full and fair opportunity to litigate the validity of a patent. For example, where appellate review has been foreclosed, parties have maintained that estoppel of judgment should be inoperative.[63] Patentees

62. *See* Blumcraft v. Kawneer Co., 482 F.2d 542 (5th Cir. 1973).

63. In Hall v. United States Fiber & Plastics Corp., 476 F.2d 418 (3d Cir. 1973), the district court had held that the patent was invalid and that the defendant had not infringed. An appeal was taken only on the question of validity, which the patentee claimed could be asserted against him subsequently under *Blonder-Tongue*. The Court dismissed the appeal as moot and held that the estoppel effect was a matter to be addressed in a later suit, citing Rest. Judgments, § 69(2) to the effect that foreclosure from appeal by reason of mootness deprives a judgment of its conclusive effect. *But see* Sampson v. Ampex Corp., 478 F.2d 339 (2d Cir. 1973) (estoppel granted although appeal not pursued).

have also objected to estoppel predicated on patent invalidity when the first trial procedure was unorthodox.[64] In the *Blumcraft* cases,[65] estoppel was unsuccessfully contested on grounds of justice and equity where two prior decisions had divided on the question of the patent validity. Attempts to elude estoppel based on considerations of justice and equity have, since the *Blonder-Tongue* decision, generally failed.[66]

The Western District Court reasoned that, since the law favors inventiveness, considerations of justice and equity made collateral estoppel inapplicable.[67] This observation, of course, would be equally apposite to every patent case, and would perforce eliminate substantially all collateral estoppel under the new *Blonder-Tongue* precept. The Western District's reliance on justice and equity would appear to overlook the significance of the prior judgment of invalidity. Its rationale is also at odds with the thrust of the Supreme Court discussion, emphasizing the paramount public interest in maintaining patent monopolies only where appropriate.[68]

64. *But see* Carter-Wallace, Inc. v. United States, 496 F.2d 535 (Ct. Cl. 1974), according estoppel effect against a patentee, based on Carter-Wallace, Inc. v. Otte, 474 F.2d 529 (2d Cir. 1972), *cert. denied* 412 U.S. 929 (1973).

In *Otte*, because the defendant was trustee in a bankruptcy reorganization of the alleged infringer, it had no resources to present a full defense. Consequently, the defendant's case was presented by incorporation of testimony from a trial by the patentee against a different defendant.

65. Blumcraft v. Kawneer Co., 482 F.2d 542 (5th Cir. 1973) (patent invalid under *Blonder-Tongue*); Blumcraft v. Architectural Art Mfg. Co., 337 F. Supp. 853 (D. Kan.) *aff'd* 459 F.2d 482 (10th Cir. 1972) (patent invalid under *Blonder-Tongue*); Blumcraft v. United States, 372 F.2d 1014 (Ct. Cl. 1967) (patent valid); Blumcraft v. Citizens & Southern Ntl. Bank, 407 F.2d 557 (4th Cir.), *cert. denied* 395 U.S. 961 (1969) (patent invalid).

66. The isolated exception that has come to our attention, permitting relitigation of the issue of patent validity, is Grantham v. McGraw-Edison Co., 444 F.2d 210 (7th Cir. 1971). That case, decided within a week of *Blonder-Tongue*, presented a number of exceptional factors, including a change in patent ownership and a truncated earlier trial. *See also*, Berner v. British Cmwlth. Pacific Airlines, Ltd., 346 F.2d 532 (2d Cir. 1965), *cert. denied*, 382 U.S. 983 (1966) (non-patent; a multi-victim accident litigation).

67. Summary 168.

68. 402 U.S. at 343-46, and cases cited therein.

We thus are unable to support the Western District Court's basis for invoking principles of equity and justice. While it may be that some combination of circumstances based on independent equitable considerations might arise to warrant denial of estoppel, we perceive nothing on the facts here that would indicate such a result.

We also take cognizance that this Circuit has long been in the vanguard of an amplified application of collateral estoppel principles. In 1950, Judge Hastie anticipated *Blonder-Tongue* when in Bruszewski v. United States,[69] a non-patent case, he abandoned the mutuality requirement and held the plaintiff estopped from relitigating a liability issue he had tried and lost in a former case against a different defendant. Since then, the Third Circuit has "adopted a rather expanded view" regarding collateral estoppel[70] and, at least for defensive purposes, collateral estoppel may be asserted without mutuality "unless some overriding consideration of fairness to a litigant dictates a different result."[71]

G. Application of Blonder-Tongue *to the Present Case.*

The Western District Court decided that, in the present case, no collateral estoppel effect should be conferred on the former judgment.[72] The Michigan court in *McLouth*, it is recalled, had held the Suess patent to be invalid, and the Sixth Circuit affirmed. In brief, the *McLouth* courts had decided that the claims of the patent failed in several

69. 181 F.2d 419 (3d Cir.), *cert. denied*, 340 U.S. 865 (1950). In a protest against the *Triplett* doctrine in the patent field, Judge Hastie dissented in Nickerson v. Kutschera, 419 F.2d 983, 984 (3d Cir. 1969), on grounds of collateral estoppel.

70. Lynne Carol Fashions, Inc. v. Cranston Print Works Co., 453 F.2d 1177, 1181 (3d Cir. 1972).

71. Bruszewski v. United States, 181 F.2d at 421. Lynne Carol Fashions, *supra* note 70; Provident Tradesmens Bank & Trust Co. v. Lumbermens Mutual Casualty Co., 411 F.2d 88 (3d Cir. 1969); Scooper Dooper, Inc. v. Kraftco Corp., 494 F.2d 840 (3d Cir. 1974). Possible affirmative use of collateral estoppel against a losing defendant, a concept not at issue here, was suggested by the Court en banc in Katz v. Carte Blanche Corp., 496 F.2d 747 (3d Cir. 1974), *cert. denied* 43 U.S.L.W. 3213 (Oct. 15, 1974).

72. Opinion Summary 168.

respects to conform to the patent statute, and that the interpretation urged by the plaintiffs was legally impermissible by reason of the doctrine of file wrapper estoppel.[73] Thus, before the Western District Court could appropriately reject collateral estoppel in the present case, it had to find that each of these two bases of decision was unreliable under the *Blonder-Tongue* guidelines.[74]

In considering the issue of collateral estoppel, the Western District Court undertook an extensive investigation of the *McLouth* case. It re-examined not only the opinions but the entire record and briefs of *McLouth* with minute attention to detail. The Western District extended its study beyond the record of *McLouth* and consulted outside authorities to aid its understanding. The method of analysis pursued by it was to advance point by point through the *McLouth* opinions and, at each juncture, to provide the reader with a critique of the support in the record on which the Michigan court and Sixth Circuit opinions rely.[75]

The Western District Court, purporting to employ the criteria of *Blonder-Tongue,* first ascertained that the matter before it was indeed "one of those relatively rare

73. The Sixth Circuit discussion is in 400 F.2d, *supra,* at 49-53.

74. Kaiser argues that where a decision is premised on more than one ground, neither ground carries any collateral estoppel effect. In support, Kaiser refers to Halpern v. Schwartz, 426 F.2d 102 (2d Cir. 1970). In *Halpern,* an earlier case had voided a transfer in bankruptcy, based on three independent grounds. One ground was that the transfer was "intentional." One of the parties attempted to assert the collateral estoppel effect of the finding that the transfer was intentional. The Second Circuit declined to permit this effort, ruling that the isolated word formed but a part of one of three separate grounds of decision. The court reasoned that it would be improper to assume that "intentional" was used with the requisite consideration for collateral estoppel to apply.

By contrast, in the case here, all the grounds of the very core of the first decision, that is, the invalidity of the Suess patent, are urged for collateral estoppel purposes, and it is beyond question that the entire *McLouth* determination was accompanied by a carefully considered and plenary review. No suggestion was made in *Blonder-Tongue* that a holding of patent invalidity predicated on several grounds was entitled to less collateral estoppel weight than a patent held invalid for but one reason.

75. *See,* for example, the Western District Court's consideration of the *McLouth* discussion of "Onto and below the surface" at Summary 46-47 and Compendium 175-187, and its analysis of the *McLouth* result regarding "Material agitation" at Summary 48-55 and Compendium 188-212.

instances where the courts wholly failed to grasp the technical subject matter and issues in suit."[76] In particular, it stated that the trial court in *McLouth* "wholly failed to grasp" the "true invention" of the patentees,[77] namely, the separation of the reactions into two chemical components: a heat generating (exothermic) portion and a heat absorbing (endothermic) portion.

Moreover, the Western District Court found that, by concentrating excessively on the concept of "avoidance of deep penetration" and emphasizing the mechanical, physical aspects of the process to the exclusion of the chemical phenomena, the Michigan court had reached a totally fallacious conception of the invention.[78] Affirmance of the Michigan court by the Sixth Circuit, the Western District Court maintained, was based upon the same misconception of the invention.[79] Once it resolved that the *McLouth* courts wholly failed to grasp the scientific process at issue, the Western District accordingly found that no estoppel effect attached to the *McLouth* determination that the claim language of the Suess patent did not satisfy the requirements of section 112.

In order to overcome the estoppel effects of *McLouth* entirely, the Western District Court was also forced to call into question the second basis for the holding in *McLouth,* that file wrapper estoppel foreclosed the interpretation of the Suess patent urged by Kaiser. On this matter, the Western District stated that the Michigan court had raised the issue of file wrapper estoppel *sua sponte.*[80] The Western District reasoned, therefore, that under the *Blonder-*

76. 402 U.S. at 333.

77. Summary 148.

78. Summary 148-154; Compendium 67-68.

79. Summary 113, 136.

80. It is not the case that the Michigan District Court raised the file wrapper estoppel issue for the first time in its opinion. Earlier, at final trial argument in *McLouth,* the Michigan District Court specifically confronted the Kaiser attorney with the possibility of a file wrapper estoppel. The response was a brief denial by Kaiser's counsel of the applicability of the doctrine to the pending case. No request was made at that time by Kaiser to reopen the record for submission of evidence or briefs.

Tongue guidelines, Kaiser had been prevented, without fault of its own, from presenting evidence on the crucial issue whether the language "avoid deep penetration" had been abandoned by the patentees. After receiving evidence on the question of file wrapper preclusion, the Western District was persuaded that no abandonment of the patentable concept, avoidance of deep penetration, had in fact occurred during the Patent Office proceedings. Consequently, it held that the language appearing in the Suess claims could be read to include the patentable invention which the Western District Court found was described in the specification.

For these two reasons, the Western District determined that the *McLouth* decisions provided no estoppel defense, and it was thereby free to draw its own conclusions regarding patentability and file wrapper estoppel from the evidence before it. The Western District Court thereupon held that the Suess patent was valid, and that the defendant had infringed it. Judgment was granted for plaintiffs.

We are asked to review, as a matter of law, whether the Western District Court properly interpreted and applied the *Blonder-Tongue* standards regarding collateral estoppel.

1. Alleged Deprivation of Crucial Evidence.

Although there is some dispute about the admissibility and probity of such evidence as Kaiser produced in the Western District Court,[81] we accept *arguendo* Kaiser's assertion that such evidence was admissible and helpful to it. Nonetheless, we cannot agree that the absence of this evidence in *McLouth* vitiates the collateral estoppel effect of the earlier determination. In *McLouth*, claims Kaiser, inadequate evidence was presented to resolve the question whether Kaiser in fact abandoned its concept of "avoid deep penetration" by removing that language from the claim and inserting the phrase, "avoid material agitation." Since this matter was raised *sua sponte* by the Michigan court after the evidence was closed, Kaiser contends, it was thereby deprived of an opportunity to present testimony disproving the conclusion reached by the Michigan court.

81. Jones & Laughlin contends that the proper application of the file wrapper estoppel doctrine permits consideration only of the written documents in the Patent Office file. It urges that no testimony may properly be adduced regarding the contents of discussions between the patent examiner and the patentee. A close reading of the Sixth Circuit opinion, quoted *supra* at n.45, 400 F.2d at 54, may substantiate this theory. The Sixth Circuit noted a "void" in the *McLouth* trial record respecting the reasons for the eleventh hour substitution of claim language. However, this lack was apparently not critical to the Sixth Circuit, which inferred abandonment because earlier claims of "avoid deep penetration" had been rejected under prior art. Because we determine that collateral estoppel precludes further litigation on the file wrapper question, the scope of inquiry in file wrapper estoppel disputes is not an issue the Court must address.

We have carefully studied the relevant papers in *McLouth*, including the trial and appellate briefs and opinions, regarding the issue of file wrapper estoppel. In the course of examination it has been helpful to refer to the *McLouth* record. We have considered the Supreme Court cases that are relied on in the Sixth Circuit as the framework for the latter court's holding on file wrapper estoppel.[82] And we have reviewed carefully the opinion of the district court in this case.[83]

In order to show that a prior judgment is not binding for want of essential evidence, a patentee must fulfill the two criteria of the Supreme Court test. It must persuade the second court that the additional evidence was crucial to a proper resolution in the first tribunal, and that the patentee bore no responsibility for the absence of the evidence in the prior trial. Kaiser has not shown either element.

82. Schriber-Schroth Co. v. Cleveland Trust Co., 311 U.S. 205 (1940); Exhibit Supply Co. v. Ace Patents Corp., 315 U.S. 126 (1942); Smith v. Magic City Kennel Club, Inc., 282 U.S. 784 (1931). *See* Trio Process Corp. v. L. Goldstein's Sons, Inc., 461 F.2d 66 (3d Cir.), *cert. denied*, 409 U.S. 997 (1972).

83. This Court expresses no views on the correctness of the holdings in *McLouth*—either by the district or appeals court—pertaining to the file wrapper estoppel issue. *See* note 59, *supra*.

First, since the Michigan court invalidated the Suess patent on independent grounds of indefiniteness under section 112, the file wrapper estoppel evidence may be described as "crucial" only if the indefiniteness ground of decision fails. However, for purposes of collateral estoppel, we must accept the *McLouth* invalidation of the Suess patent based on the inadequacy of the claims under section 112, unless the Michigan court did not comprehend the case or, specifically, that issue. We do not find the Michigan decision so infirm.[83a] Hence, the file wrapper evidence is not crucial.

Second, even assuming the file wrapper evidence is crucial, we are also unable to hold that Kaiser was blameless as to the lack of evidence regarding this issue. On appeal to the Sixth Circuit, Kaiser had the opportunity to complain about the matter of reliance, *sua sponte*, by the Michigan court on file wrapper estoppel. Kaiser chose to dispute neither the procedural manner in which the file wrapper issue was raised by the Michigan court, nor the fact that Kaiser was not given an opportunity at the trial to present evidence on file wrapper estoppel. Instead, Kaiser in the Sixth Circuit relied on the legal argument that no file wrapper estoppel should obtain where "nothing has been surrendered . . . there was a mere rephrasing of the claims,"[84] and where affidavits accompanying the new claims explained the new terminology. The Sixth Circuit majority rejected Kaiser's contentions regarding the legal effect of the patentee's actions on the Patent Office.

Now Kaiser assumes a different posture and raises objections to the *McLouth* proceeding that are bottomed, not on the legal aspects of file wrapper estoppel, but rather on the foreclosure of evidence. In the absence of a compelling reason why it could not have raised this objection at the time of the *McLouth* appeal, Kaiser is not at liberty to voice such a protest here.

83a. *See* notes 88-93, *infra*, and accompanying text.

84. Kaiser, Brief to Sixth Circuit in *McLouth*, 26.

The reasons advanced for the evidentiary omission in the *McLouth* case do not excuse Kaiser for its failure to raise the subject of the file wrapper estoppel evidence.[85] The Western District Court stated that Kaiser did not argue the evidentiary point in *McLouth* because Kaiser relied on the Sixth Circuit to reverse the Michigan court as a matter of law. But this tactical determination hardly constitutes an event in which Kaiser is without fault.

It is also suggested that Kaiser's motivation to litigate was reduced because, at the time Kaiser was on trial in *McLouth*, the rule of *Triplett* was the law and therefore the scope of loss as to Kaiser was limited. We have noted above that the consequences to plaintiffs of a defendant victory in *McLouth* were sufficiently grave to provoke a vigorous prosecution of that case, even in the absence of the *Blonder-Tongue* rule.[86] No additional reasons have been urged to excuse Kaiser's failure to raise the matter on appeal in *McLouth*, nor can the Court discern any.

Thus, the *McLouth* proceedings do not disclose that Kaiser's right to a fair and full opportunity to litigate the issue of file wrapper estoppel was diminished to any degree by an inability to present crucial evidence without fault of its own. Accordingly, the Western District Court erred in receiving and considering evidence on the substantive issue of file wrapper estoppel,[87] and its judgment on file wrapper estoppel cannot be sustained.

85. Compendium 61-62.

86. *See supra* 27-28. It is not significant that the earlier holding of invalidity preceded the *Blonder-Tongue* decision. *Blonder-Tongue* on remand, 334 F. Supp. 47 (N.D. Ill. 1971), aff'd 465 F.2d 381 (7th Cir. 1972), *cert. denied* 409 U.S. 1061 (1972). *Technograph* family, *infra* note 96; *Blumcraft* family, *supra* note 65.

87. The Supreme Court indicated that the record in *Blonder-Tongue* might be supplemented on remand "with any evidence showing why an estoppel should not be imposed in this case." 402 U.S. at 350. Under such a directive, the only evidence that could appropriately be admitted in this case would be information bearing on Kaiser's decision not to appeal to the Sixth Circuit the manner in which the Michigan court raised the file wrapper issue.

2. *Alleged Failure by* McLouth *Courts to Grasp the Subject Matter and Issues.*

We next focus on the determination by the Western District Court that the *McLouth* courts "wholly failed to grasp" the scientific nature of the patented process and, consequently, that their judgments are not entitled to collateral estoppel value. We have painstakingly read the *McLouth* opinions and briefs, in concert with the claims and specification of the Suess patent. In addition, we have studied the case law on which the *McLouth* courts relied in finding the patent invalid for indefiniteness under 35 U.S.C. § 112.[88] Our review has included a careful evaluation of the Opinion, Summary and Compendium of the Western District Court.

Unlike the Western District Court, we are led to the unequivocal conclusion that the *McLouth* tribunals did not "wholly [fail] to grasp the technical subject matter and issues in suit" in deciding the validity of the Suess patent. The documentary evidence refutes the possibility that the *McLouth* courts were so misguided.[89]

A substantial number of factors contribute to our conviction. Judge Freeman, the district judge in *McLouth*, allocated an unusual amount of time to the trial, and devoted considerable effort to understanding the underly-

88. *See e.g.*, the following cases cited by the Sixth Circuit: Halliburton Oil Well Cementing Co. v. Walker, 329 U.S. 1, 13 (1946) ("a patentee cannot obtain greater coverage by failing to describe [its] invention than by describing it as the statute commands"); United Carbon Co. v. Binney & Smith Co., 317 U.S. 228 (1942) (indefinite claims do not give notice of the invention that is required by Congress); Thabet Mfg. Co. v. Kool Vent Metal Awning Corp., 226 F.2d 207 (6th Cir. 1955) (patentee is bound by definition of phrase suggested to, and accepted by, the Patent Office).

The following additional cases were cited by the Michigan District Court: General Electric Co. v. Wabash Appliance Corp., 304 U.S. 364 (1938) (the claims measure the invention; they must inform the public of the limits of the invention); Schriber-Schroth Co. v. Cleveland Trust Co., 305 U.S. 47 (1938) (claims cannot claim more than the specification discloses).

89. *See* Wahl v. Vibranetics, 474 F.2d 971 (6th Cir. 1973), where the Court of Appeals affirmed a grant of summary judgment for defendants based on collateral estoppel over protests that the earlier trial court had misunderstood the case and that crucial evidence was unavailable at the first trial. *See also* cases cited in notes 65, 96.

ing industrial and scientific principles. He was alert to the contentions of the parties and "keenly aware of the issues for decision."[90] This is evidenced by Judge Freeman's reading of voluminous documents, his presence at experiments scheduled for his edification, and his close attention to questioning at trial, all recited in his opinion. Moreover, the judge himself conducted intelligent questioning of counsel and expert witnesses during the trial and arguments.[91]

The Michigan court produced a comprehensive and comprehensible opinion, where extensive evidence was marshalled in an orderly and readily-digested fashion. A description of general steelmaking procedures was followed by a detailed discussion of the basic oxygen method. The exposition of the oxygen process revealed that the writer possessed a sure understanding of what occurred, chemically as well as physically, during the basic oxygen process. Finally, the Michigan court undertook a meticulous legal analysis of the requirements of definiteness under Section 112.

It would be unseemly to claim that the Michigan court did not understand the theories of the parties or ignored the evidence before it. Throughout the opinion, it supported its findings with extensive citations to the record. Indeed, the gist of the invention as found by the Michigan court, and affirmed on appeal, was precisely the definition advanced by the plaintiffs.

On appeal, no contention was heard that the Michigan court had misdefined or misunderstood the plaintiffs' invention. The facts found at trial were accepted without quarrel. Kaiser's contention on appeal was primarily a legal one, namely, that, when read properly, the claims and specification of the patent satisfied section 112. In *Blonder-Tongue*, the Supreme Court expressed special concern about patent litigation encrusted with rarified scientific

90. *Id.* at 975.

91. *See, e.g.*, 257 F. Supp. at 387, 394-95, 405, 425, 430, 433, 439.

concepts that have at times baffled judges untrained in the sciences.[92] But it appears that the questions presented to the Sixth Circuit involved essentially the meaning of reasonably non-technical language, and whether plain words in documents fulfilled the statutory mandate. Judges are uniquely well-qualified to resolve such questions.

On balance, the *McLouth* opinions are internally consistent, creditable analyses that appear compatible both with the language of the patent at issue and the principles of controlling law.

Other cases interpreting the *Blonder-Tongue* doctrine have required a most stringent standard for demonstrating failure of scientific comprehension.[93] In *Blonder-Tongue* on remand the district court responded to plaintiffs' argument that the initial trial court had not understood the technical issues by stating that, "It would demand arrogance to so conclude. . . . [The goals of *Blonder-Tongue*] cannot be achieved if mere disagreement in the second court supervenes the defense."[94] The Second Circuit has held that collateral estoppel will operate unless the first trial court has committed "an egregious error" involving a "blatant misunderstanding."[95]

Based on our consideration of *McLouth,* and without expressly endorsing the determination in *McLouth,* we hold that this case is not one of the rare exceptions enumerated in *Blonder-Tongue* where estoppel may be avoided because the courts in the earlier case did not fathom the process disclosed in the patent.

3. The Scope of Review.

It is necessary to comment on the scope of review undertaken by the Western District in reaching its conclu-

92. 402 U.S. 331-32, and cases cited therein.

93. No case has come to our attention holding that estoppel was inappropriate because of a failure of comprehension in the first trial.

94. 334 F. Supp. 47, 50 (N.D. Ill. 1971), *aff'd per curiam* 465 F.2d 381 (7th Cir.), *cert. denied* 409 U.S. 1061 (1972).

95. Sampson v. Ampex Corp., 478 F.2d 339 (2d Cir. 1973).

sions. Such review should be confined to as narrow a scope as is consonant with assuring a full and fair opportunity to litigate in the prior case. More probing review would be contrary to the purpose of the *Blonder-Tongue* rule. Unfortunately, no bright line emerges to distinguish between the review that *Blonder-Tongue* requires, and the unsparing scrutiny that would eviscerate the *Blonder-Tongue* doctrine.[96] Yet, guide posts have been erected.

District courts obliged to rule on *Blonder-Tongue* estoppel motions have, as we have here, reviewed certain pertinent data relating to the first trial for the general purpose of establishing that a full and fair opportunity to litigate was offered. They have considered, for example, whether the matter was tried, or whether it terminated by summary judgment, consent, or other settlement. Beyond examining the amplitude of the opinions, courts have also taken note of the length of trial, the pages of testimony, the number of witnesses and the exhibits.[97] A reading of the opinions, briefs, docket sheets, and other documents of record frequently suffices to resolve any doubts regarding a full opportunity to litigate.[98]

In Sampson v. Ampex Corp.,[99] in order to ascertain whether estoppel would be appropriate, the Second Circuit

96. For a discussion of this problem, *see* Smith, The Collateral Estoppel Effect of a Prior Judgment of Patent Invalidity: *Blonder-Tongue* Revisited, 55 J.P.O.S. 285, 363, 436 (1973).

97. *Blumcraft* family of cases, *supra* note 65. Technograph Printed Circuit cases, all predicating estoppel on Technograph Printed Circuit, Ltd. [TPC] v. Bendix Aviation Corp., 218 F. Supp. 1 (D. Md. 1963), *aff'd per curiam,* 327 F.2d 497 (4th Cir. 1964), *cert. denied* 379 U.S. 826 (1964); TPC v. United States, 484 F.2d 1831 (Ct. Cl. 1973); TPC v. Methode Electronics, Inc., 484 F.2d 905 (7th Cir. 1973); TPC v. Martin-Marietta Corp., 474 F.2d 798 (4th Cir. 1973).

See also the factors discussed in United States v. Air Lines, Inc., 216 F. Supp. 709, 725-30 (E.D. Wash. 1962), *aff'd sub nom.* United Air Lines, Inc. v. Wiener, 335 F.2d 379, 404-05 (9th Cir. 1963), *cert. dismissed,* 379 U.S. 951 (negligence case).

98. Where a particular claim of deprivation of crucial evidence is raised, some analysis of the record to garner the relevant procedural facts may be required.

99. 478 F.2d 339 (2d Cir. 1973).

undertook a review of the voluminous record of the earlier trial. Judgment at the earlier trial had been adverse to the patentee, but because the parties had reached a settlement after trial no appeal had been prosecuted. The Second Circuit circumscribed its interest in the record most carefully, insisting that it did not re-assess the merits of the trial:

> Rather, we have examined the merits in the [earlier] case only to satisfy ourselves that decision was not based on such a blatant misunderstanding of the relevant legal principles as to make application of the estoppel doctrine inequitable.[100]

The Supreme Court in *Blonder-Tongue* indicated that, where the opinions exhibit an utter lack of comprehension by the initial judges,[101] a patentee might secure a second trial of the patent's validity. While examination may legitimately encompass more than the face of the opinions, the Supreme Court strongly suggested that when a court is asked to investigate the competence of an earlier trial court, its function is strictly limited. In practice, subsequent courts have inspected the record to observe whether the first judge appeared to exhibit an understanding of the matter during the proceedings. It has been found helpful, although not indispensable, to search the record of the former case to substantiate or refute an argument relating to an estoppel defense. In Wahl v. Vibranetics, Inc., the Sixth Circuit examined the record of an earlier case to discover whether the first judge had understood the scientific basis of the patent.[102] It concluded that no failure to comprehend the subject matter was demonstrated because the record disclosed that the district court was "keenly aware" of the issues for decision and the contentions of the parties.

100. *Id.* at 342-43.

101. 402 U.S. at 333.

102. 474 F.2d 971 (6th Cir. 1973). Technograph Printed Circuits, Ltd. v. Martin-Marietta Corp., 474 F.2d 798 (4th Cir. 1973).

The judge had participated, as Judge Freeman did in the Michigan case, in questioning witnesses; and he engaged in discussions with counsel regarding proposed findings of fact, revealing a working knowledge of the subject.

In determining whether the *McLouth* courts had the necessary scientific command of the basic oxygen process, the Western District Court conducted an extraordinary, wide-ranging scrutiny of the first trial. It concluded that in order to know whether the *McLouth* courts understood the basic oxygen process, it was necessary (a) to conduct independent evaluations of the experiments that the Michigan Court viewed;[103] (b) to reinterpret the testimony and the credibility of expert witnesses in *McLouth;*[104] (c) to resort to outside authorities for an understanding of the scientific information presented in *McLouth;*[105] (d) to weigh testimony; and (e) to interpret certain documentary evidence.[106]

Positions taken by counsel for plaintiffs in *McLouth* were reconstrued, and reasons were given to excuse binding the plaintiffs to the manner in which they conducted the trial.[107] Guided by hindsight, the Western District dissected the findings of the *McLouth* trial and reached its own conclusions because "the prior District Court found as best it could from the mass of evidence and exhibits, most of which could not be detailedly and fully examined, . . . while I on the other hand was not so hampered."[108]

103. *E.g.*, Summary 59-63, 95, 154. Compendium 15.

104. *E.g.*, Summary 67-80, 92, 95, 154.

105. *E.g.*, Summary 78-79. Compendium 12, 201-02.

106. *E.g.* Summary 153.

107. *E.g.*, Summary 91; 92 ("I, by hindsight, now realize that counsel for the plaintiffs might have pointed to much in the specifications for answers to the district court's questioning. . . ."); 94, 95-96 (". . . plaintiffs' counsel . . . put on a 'selling campaign' to the district court of 'reduced impact pressure of the jet on the bath so as to avoid deep penetration' and . . . he in very great likelihood oversold the feature at the trial"); 162 ("I considered the submissively respectful attitude of plaintiff's counsel . . ." and "plaintiff's counsel said the gist or the primary difference between the prior art process and [Suess] was that 'you avoid deep penetration'"); 163 ("overemphasis [by counsel] is a common fault").

108. Summary 79. Compendium 14-15.

Although *Blonder-Tongue* endorses a review of the prior trial by the district court judge in a subsequent case, it does not authorize unbridled excursions into the record of the earlier trial before applying the estoppel of the previous judgment. We have concluded that the Western District Court did not confine its inquiries to proper bounds, namely, whether the Michigan court displayed an understanding of the issues presented, adequately considered the evidence, and came to conclusions not altogether in disregard of the relevant technology, the evidence presented, and the governing principles of law. In deciding that the *McLouth* courts did not have an adequate command of the scientific subject, the Western District Court considered evidence not properly before it and delved impermissibly into the merits of the earlier case. Such procedure results in a substantial misallocation of judicial resources and undermines the very purposes of *Blonder-Tongue.*

H. Conclusion.

In fashioning the rule of *Blonder-Tongue,* Justice White for a unanimous Court made it clear that a determination of patent invalidity, after a thorough and equitable judicial inquiry, creates a collateral estoppel barrier to further litigation to enforce that patent. The *Blonder-Tongue* result advances the salutary goals of avoiding commercial intimidation based on patents that have once been declared invalid, and of conserving limited judicial resources. At the same time, fairness to litigants, both patentees and others, is preserved.

The case before us presents a situation quite akin to that in *Blonder-Tongue.* No exceptional circumstances have been suggested that would warrant a result here contrary to that reached in the *Blonder-Tongue* case. Indeed, arriving at such an adverse conclusion would, in effect, dismantle the beneficient effects of the Supreme Court rule.

Since the district court erred in its determination that the *McLouth* decision erected no collateral estoppel bar to the present litigation, we reverse its determination. An order will be entered directing the district court to grant judgment for the defendant based on collateral estoppel.

A True Copy:

Teste:

Clerk of the United States Court of Appeals for the Third Circuit.

(A.O.—U. S. Courts, International Printing Co., Phila., Pa.)

Before: Adams, Gibbons and Weis, *Circuit Judges*

[Entered April 4, 1975]

Judgment

This cause came on to be heard on the record from the United States District Court for the Western District of Pennsylvania and was argued by counsel.

On consideration whereof, it is now here ordered and adjudged by this Court that the judgment of the said District Court, entered February 19, 1974, be, and the same is hereby reversed, and the said District Court is directed to grant judgment for the defendant based on collateral estoppel, in accordance with the opinion of this Court. Costs taxed in favor of appellant.

Attest:

Thomas F. Quinn
Clerk

OPINION OF THE DISTRICT COURT

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF PENNSYLVANIA

Civil Action No. 61-551

Kaiser Industries Corporation, *Plaintiff*

v.

Jones & Laughlin Steel Corporation, *Defendant*

Civil Action No. 62-272

Kaiser Industries Corporation,
Vereinigte Oesterreichische Eisen-Und
Stahlwerke Aktiengesellschaft, and
Brassert Oxygen Technik, A.G., *Plaintiffs*

v.

Jones & Laughlin Steel Corporation, *Defendant*

[Decided January 29, 1974]

Rosenberg, *District Judge*

OPINION SUMMARY—COLLATERAL ESTOPPEL

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Opinion Summary—Collateral Estoppel

This opinion summary is the finalization of the entire opinion required of me in these cases. But for many reasons, one of which is my hope that clarification of and a greater facility for understanding of the highly technical subject matter and its issues can best be achieved, I shall term the opinion itself "Compendium" to which references are made in this opinion summary directly to details. The compendium opinion is actually the report of my inquiry into the opinions of the prior District Court and the Court of Appeals in an identical patent subject-matter case before them, and as such contains my study, analysis, discussions, record references, authorities, my conclusions, and my specific findings of fact and conclusions of law as directed by Federal Rule of Civil Procedure 52.

The trial of the issues raised in these two consolidated patent actions, on oxygen application for the conversion of iron into steel, had been completed when the plaintiffs filed their "Motion to Reopen the Record" on June 16, 1969, and to allow them to produce additional evidence. This was occasioned by reason of the *sua sponte finding* by the prior District Court that file wrapper estoppel was applicable against the plaintiffs' right to pursue their action in that proceeding

[2] At the first post trial hearing the plaintiffs produced the evidence by way of a deposition of Claude A. LeRoy, Primary Examiner, who stated that the interviews before him were occasioned because of the wording of the claims; that everyone knew that prior art penetrated the oxygen jet deeply into the molten bath, but that the purpose of the applicants was to differentiate from prior art and to create a surface oxygen contact where the recognized reaction zone would occur; that the Patent Office did not like negative words and that the words upon which they agreed of "discharging a stream of oxygen vertically

downwardly through the slag layer onto and below the surface of the bath at the central portion thereof" was to be "to an extent to avoid material agitation of the bath by the oxygen stream".[1] This evidence was corroborated by the attorney who prosecuted the continuation-in-part application. The defendant presented no witnesses of its own. However, the defendant objected to admission of this into evidence as being immaterial, and subsequently in a brief, it raised the additional objection that the evidence violated the parol evidence rule. I admitted **[3]** the evidence over the objection and for the reason that if the patent was to be considered as a contract that the evidence did not attempt to vary, alter or contradict the contract, but that rather it attempted to explain the meanings of the terms contained therein.

Later on May 20, 1971 the defendant filed a "Motion for Leave to File a Plea of Estoppel" in accordance with the latest rulings of the Supreme Court on patent prosecutions in *Blonder-Tongue Laboratories, Inc.* v. *University of Illinoris Foundation et al.*, 402 U.S. 313 (1971). Prior to *Blonder-Tongue, Triplett* v. *Lowell*, 297 U.S. 638 (1936) permitted unlimited prosecutions by patentees against any number of defendants whereever they might be found. The Supreme Court in *Blonder-Tongue*, in correcting the evils under *Triplett*, denied a patentee a second choice against any other defendant where he was unable successfully to establish a right of action in the first action.

The Supreme Court speaking through Mr. Justice White, however, recognized the possibility that there could be some cases, where without fault on the part of the plaintiff, the court of courts "wholly failed to grasp the technical subject and issues in suit". *Blonder-Tongue* v. *University Foundation, supra*, at page 333. It therefore, placed the obligation of making **[4]** a determination on the subsequent trial

[1] PX1, col. 12, lines 12-16.

judge on whether an estoppel plea in the subsequent patent trial on the identical issues should apply. It reminded that "In the end, decision will necessarily rest on the trial courts' sense of justice and equity." It stated that it would thereafter be "insufficient in and of itself to justify patentees relitigating validity issues as long as new defendants are available. This is especially true if the court in the second litigation must decide in a principled way whether or not it is just and equitable to allow the plea of estoppel in the case before it." *Blonder-Tongue, supra,* at page 334.

Certain rules were there laid down for the guidance of subsequent courts in cases which might arise. Thus, the Supreme Court not only modified the highly unjust practice of previous multifarious actions by a patentee after suffering a defeat but it also protected any patentee where justice and equity required that it be done.

In the second post-trial hearing the plaintiffs presented evidence through one of their experts of the **[5]** trial court's failure to comprehend the scientific testimony presented by him. They also presented evidence of a former patent commissioner and patent office practitioners regarding patent office procedure and customs. The defendant presented no witnesses but relied on a series of exhibits such as pretrial stipulations, letters between individuals, newsletters and arguments in briefs of the parties and certain pleadings in the prior McLouth case, including the final judgment on July 19, 1966 holding the Suess patent invalid. These exhibits present primarily matters of dispute and much that is immaterial to the issues permitted by *Blonder-Tongue*. Only the final judgment in McLouth had any credible value and I gave it full consideration.

Thus it was that these two pleadings, actually pretrial matters, were presented and heard post trial, due to the circustances which brought them about.

[6]

Iron Background

Early man first became acquainted with iron masses when they were hurled from the sky as meteorites. He quickly learned that these were capable of providing certain uses which were not available in the softer free metals, such as copper and gold, that had been at his disposal in prior times. Soon after he learned that certain soil when fired by the charcoal obtained from wood provided him with similar hard substances. He had earlier learned that the heated chunks of metals were malleable and could be shaped and even hardened by hammering.

The advantage of the manufacture of iron from iron ore came from the time in the year 2000 B.C. in India by the construction of the first blast furnace. The blast furnace was used by advanced people everywhere until sometime in the 19th century. It is reported that the hills of Pennsylvania, where iron ore and the abundance of trees were available, were dotted with blast furnaces. In England, the blast furnace use became so prevelant that at one time it was feared that the country would suffer deforestration because the timber was so lavishly used in feeding the blast furnace fires. It was then that the iron makers found that coal could be converted into [7] coke so as to produce a high enough temperature as with charcoal from the wood of the forest previously. Thus, the initial essentials were conducted of having carbon from coke, iron from iron ore and oxygen from the air in an oxidation process of converting the ore into impure iron. As time progressed its purification was given another lift when Bessemer invented his converter which contained a series of tuyeres or pipe-like inlets in the bottom of a kettle-like apparatus and through which air could be blown at a high velocity into and through the molten metal in the vessel. This brought about a higher temperature and a greater oxidation of the oxidizable elements of the iron. This and its equivalent vessel, the

Thomas converter in Europe were much in use and produced a quality of steel for many purposes. The big fault with these converters was that there was no way of preventing the nitrogen from the air becoming a chemical part of the finished product.

Then came the Siemens-Martin furnace, or open-hearth as it is better known, in the 1870's or 1880's. This consisted of a rectangular room-shaped furnace or a series of such furnaces in which the molten metal was poured and in which high [8] temperatures were generated by means of liquid or gas hydrocarbon fuels. The heat created in these was so intense as to cause the molten metal to actually boil much in the same way as water is made to boil on a kitchen range. By means of the open-hearth furnace the highest quality steel was produced and even the character and quality of the steel could be controlled to produce the finished product for special uses. And yet while the open-hearth had the capability of such production, it had a disadvantage too and that was that originally it took eleven to twelve hours to oxidize the crude blast iron into quality steel. A little later some steelmakers duplexed the Bessemer method with the open-hearth and shortened the time period. And still later, as we shall see, new ways were introduced to speed up the oxidation process so that eventually the finished steel could be made in a matter of hours.

In the meantime there were users of the electric [9] furnace which was capable of producing steel with a special carbon content valuable in the production of tools and such other products, but it had the disadvantage of requiring expensive electricity to generate high temperatures which the oxidation process required. While the Bessemer and Thomas converters were blowing air through the bottom tuyeres, there were some steelmakers who attempted in the latter part of the 19th century to blow whole air onto the surface of the bath but failed to produced any beneficial results.

[10] A scientific achievement occurred in 1898 which was bound to help the steel industry when Dr. Carl Linde discovered a method of extracting oxygen from the air. Before that oxygen, used primarily in laboratories, was manufactured by means of eletrolysis which separated water into its oxygen and hydrogen parts. With Dr. Linde's discovery, oxygen began to be looked upon for possible properties in aiding the steel industry; and in the 1920's it was evident [2] that the United States Department of the Interior reported on its possible use in improving blast furnace uses. However, when in 1928 Fraenkl (sometimes referred to as Frankl) came up with his method of producing oxygen from air on a tonnage basis, interested parties began to give it more attention. The Linde-Fraenkl Company in Germany established a plant for the production of oxygen and several other plants sprang up in Europe. These stored the oxygen in bottles, as was done before, and transported them to places where they were to be used. The United States during the war built portable oxygen plants for use by its military in other parts of the world. In Weirton, West Virginia in 1946, the Weirton Steel Company established a plant for limited uses. Mostly the oxygen was used in steel plants in **[11]** torches for cutting purposes. But steelmen both in Europe and the United States began to look at it as an agency for improving steel production.

In Europe the Linde-Fraenkl process was applied to extracting nitrogen from the air for fertilizer purposes and the oxygen became its by-product. In fact on one occasion a furnace was built at Suddeutsche Kalkstickstoff Werke, Trostberg, in Eastern Barvaria, for use in blast furnaces but it was abandoned. Dr. Durrer and Dr. Hellbruegge went to Trostberg to work on a large low shaft oxygen furnace.[3] Efforts were made to enrich the air blown in Besse-

[2] Compendium I, page 18.

[3] Compendium XVII.

mer-Thomas Converters, but the increased temperatures were destructive of the tuyeres, and this was abandoned.

It remained for one Dr. Carl Schwarz, who was connected with H. A. Brassert & Co., a German steelworks, to apply for a patent in Germany on the process of blowing onto the surface of the molten metal bath at "such a high kinetic energy that it is capable of penetrating in the manner of a solid body deep into the bath." (Emphasis added)[4]. Schwarz gave very few instructions on how this was to be done but did indicate that the oxygen enriched air or oxygen itself was to be used and that its **[12]** introduction into the bath would bring about the high temperature required for oxidation away from the refractory walls and thus save them from destruction. The allowance of the patent was made known on April 8, 1943. However, not only was the process not utilized by the Brassert Company but no great rush of steelmen was recorded to adopt the use for what Schwarz declared was his invention.

In 1946, John Miles & Partners (London), Limited, applied for and was granted a patent in Belgium. Miles, recognizing the great loss of oxygen which occurred in attempting to inject it into the molten metal, now advocated that it be done by the use of an "oxidizing fluid at such speed that a sufficient proportion of the fluid penetrates into the metal . . ."[5] The fluid was to contain no more than 30% nitrogen. The instructions given by Miles were fuller than those given by Schwarz and even expressed the resulting effect of the injected oxygen into the bath by saying "The penetration of the jet also fulfills the useful function of agitating the bath so that the reactions take place uniformly and to the maximum extent."[6] This thinking was restated as follows "The jet serves to maintain a vigorous

[4] DX5A, page 2, lines 6-8.

[5] DX10A, page 2, lines 6-8; Compendium I, pages 34-35.

[6] Id. page 4, lines 4-6; Compendium I, page 34.

agitation so that the oxidizing reactions follow one another in the interior of the bath . . .'"[7] The jet serves to circulate and agitate the metal and slag . . ."[8]

[13] Still the steelmakers did not come running to see and believe what John Miles had asserted was his patent. Neither is there any evidence that John Miles & Partners had adopted the process. In fact during this period of time, more than thirty steelmen and more unnamed steelmen were active generally in the field of application of oxygen to metallurgy.[9] The most pronounced of these experimenters were Dr. Robert Durrer and Dr. Heinrich Hellbruegge, experts with the Von Roll Steel Works in Gerlafingen, Switzerland, who in 1948 commenced a series of experimentations on the teachings of Schwarz, but did not come up with any resolution of the unsolved problems that that process presented.

During that time the Austrian Government decided to re-establish the steel plants which had been destroyed by the Allies during the war. It faced the question of heavy investment in re-establishing the open-hearth furnaces or of finding something more modern. It was familiar with the experiments which were going on at Gerlafingen. Accordingly, it sent Dr. Trenkler to Gerlafingen to observe the Durrer-Hellbruegge experiments. Dr. Trenkler knew only that they were practicing the deep penetration by the oxygen jet into the molten bath as advocated **[14]** by Schwarz, but learned nothing more from his visit, except perhaps in receiving advice from Dr. Durrer. Dr. Durrer asserted that he believed in the oxygen application process to steel and advised Dr. Trenkler to continue the "experiments". The Austrians accepted the advice and established a 3-ton converter at Linz to experiment on the Schwarz process. In

[7] Id. page 10, lines 5-7; Compendium I, page 34.

[8] Id. page 18, lines 8-9; Compendium I, page 33.

[9] Compendium XVII.

the interim, four steelmakers in Europe who were experimenting with the use of oxygen agreed that they would mutually share their discoveries and permit all to use them. The patent rights were discussed and some agreements were had but not definitely.

On June 3, 1949, the Austrian experimenters, Dr. Theodor Suess, Dr. Herbert Trenkler, Dr. Hubert Hauttmann and Dr. Rudolf Rinesch[10] made their first test, and while blowing deeply suffered the loss of the use of the nozzle. On the same day, they started the next test, but this time the surround which contained the water to cool the oxygen nozzle, broke high up on the nozzle length and sprayed water on the surface of the molten bath. Although this was an accident, it resulted in producing better steel than the Austrians expected. This accidential occurrence and its result made them curious and they began to wonder whether or not the deep penetration of the prior art was really a neccessity in the oxygen application to the iron bath surface. They determined to test this theory by two different series of tests.

[15] Starting June 17th, in the first series of tests, they blew the oxygen deeply and received the same results as in Gerlafingen. Commencing with the June 25th series of tests, they changed the nozzle from a Laval type to a normal type and raised it from 10 centimeters above the surface to 15 centimeters above the surface. Although at that time the results of the product took about a week to determine, they learned that the June 25th series of tests resulted in a better quality of steel than that produced in the June 17th tests. Thereafter they carried out a series of tests on this new concept in various converters and in various ways until they had arrived at their conclusion by the end of the 250th test in November, 1950, that they had the process for making industrial steel. With this conclusion, the deter-

[10] Compendium I, pages 21-22.

mination was to made to establish both the conversion vessel and an oxygen plant to produce the oxygen necessary in the process.

On December 14, 1949[11] Dr. Durrer who evidently was in touch with the situation, in a memorandum stated:

> "'The good results consist in particular in the very low contents of carbon, phosphorus and sulfur *which contradicts all metallurgical expectations. This work shows a new metallurgy with which we must first of all become acquainted.* Presumably, the extensive removal of these substances is due to the higher temperature, the higher degree of liquidity connected therewith and the higher reaction velocity resulting therefrom.'" (Emphasis added)

On May 5, 1950[12] Dr. Durrer in a congratulatory letter to [16] the Austrians said:

> "... my most sincere congratulations on this important metallurgical progress.",

and stated that he had not expected them to be able to solve this problem so quickly, but that he was nevertheless delighted after he had seen "the beautiful results" with his own eyes. He said also,

> "Now that the problem has been solved in principle, it is only a question in the further test of details, of polishing up the process, so to speak * * *."

With the establishment of two plants by the Austrian Government, one at Linz and one at Donawitz, word soon got around among steelmakers, and since I cannot improve on what the McLouth District Court said in this regard, I quote the following:

> "The quality of the steel produced was comparable to open hearth steel, while capital and operating costs were considerably reduced. Therefore, steelmakers from all over the world came to Linz to familiarize themselves with the new Linz process. (PX343, p.12). The reaction of the steelmakers to the Linz process was one of initial skepticism followed by recognition of the invention and adoption of the process." (257 F. Supp. at page 398)

[11] DX89B(20), 257 F.Supp. at page 417; Compendium I, page 38.

[12] DX89B(22), 257 F.Supp. at page 418; Compendium I page 38.

McLouth from Michigan was one of these who sent its Mr. Lindberg to Austria and agreed thereafter to pay $100,000 for know-how relating to the Linz process; but its skepticism was not entirely abated because it spent large sums of money to [17] construct duplexing equipment in case the Linz process proved unsatisfactory. This it did because it was expanding its plant. However, the L-D process quickly proved to be highly satisfactory and it tore down its duplexing equipment. Subsequently, McLouth disavowed the L-D process and maintained that it was practicing the prior Schwarz patent process.

Another of these was the defendant in the instant actions, Jones & Laughlin, who also paid $100,000 for know-how and license rights for its Aliquippa plant, and afterwards disavowed its obligations to the Austrians and their United States licensee, and asserted that it, too, was practicing the prior Schwarz patent process. Jones & Laughlin also built a plant at Cleveland, Ohio and installed the same process there. The consideration of these matters is specially detailed in a separate opinion. Upon the disavowal by McLouth and eventually by Jones & Laughlin, actions were instituted against these respectively and in separate jurisdictions.

In the action in the United States District Court for the Eastern District of Michigan, McLouth raised the standard defense in a patent case of invalidity and non-infringement, but specifically that the Suess patent was anticipated by the prior art of Schwarz and Miles, that the process patent was obvious, that the plaintiffs were not

the inventors, but that Dr. Durrer and **[18]** Dr. Hellbruegge were, and that neither the specification nor the claims complied with the requirements of 35 U.S.C. §112 relating to definiteness. It additionally charged antitrust violations.[13]

The District Court Holdings

The District Court held that it was a "revolutionary" invention, "an outstanding invention";[14] that steelmakers from all over the world came to Linz to familiarize themselves with the process and that they came as skeptics and went away as believers and adopters of the process;[15] that the Austrians were the true inventors of the subject matter of the patent in suit;[16] that the Suess patent was neither disclose nor anticipated by the prior art and was therefore nonobvious to them,[17] except that a "localized reaction zone spaced a substantial distance from the refractory lining as set forth in the patent claim was anticipated by Schwarz and Miles, and as such obvious to persons skilled in the art;[18] and that following failures prior to 1949, "the enthusiastic reaction of industry to the invention after a period of initial skepticism, all clearly indicate that the invention by the patentees, the Linz process, was not obvious to persons skilled in the art.[19]

The District Court placed it on the points of anticipation **[19]** and non-obviousness and took opposite sides on the one theory that the invention was a physical discovery

[13] 257 F.Supp. at page 386.

[14] 257 F.Supp. at pages 441-442.

[15] 257 F.Supp. at page 398.

[16] 257 F.Supp. at page 418.

[17] 257 F.Supp. at page 406.

[18] 257 F.Supp. at page 404.

[19] 257 F.Supp. at page 406.

as against the other side that the prior art of Schwarz and Miles had already discovered the chemistry reaction.

In response, then, to charges, objections and defenses raised by McLouth the District Court found in favor of the specification that it was not indefinite[20]; that the phrase "avoidance of deep penetration" "is certainly not a fiction"[21]; that the indefiniteness of the term "localized reaction zone"[22] nor "the inadequacy of the teaching of the specification",[23] nor down in center circulation even if nonexistent,[24] nor the unproved charge of inadequate disclosure of an appropriate nozzle,[25] nor the too indefinite degree of the "high temperatures" in the localized reaction zone,[26] nor any other charges of indefiniteness[27] impaired the ability of persons skilled in the art to make and use the invention on the basis of the disclosure in the specification, because the invention was disclosed in sufficiently clear terms to enable steelmakers "to make and use the same".[28]

As related to the wording contained in the claims under **[20]** Section 112, the District Court held that the plaintiffs took the position that "avoidance of deep penetration was the gist of the invention" because such a position was essential to rebut the defenses of anticipation, obviousness and non-inventorship[29]; that avoidance of deep pene-

[20] 257 F.Supp. at page 422.

[21] 257 F.Supp. at page 422.

[22] 257 F.Supp. at page 423.

[23] 257 F.Supp. at page 423.

[24] 257 F.Supp. at page 423.

[25] 257 F.Supp. at page 423.

[26] 257 F.Supp. at pages 423-424.

[27] 257 F.Supp. at page 424.

[28] 257 F.Supp. at page 424.

[29] 257 F.Supp. at pages 425-426.

tration is clearly the subject matter of the applicants' invention and yet it could not be read into the claims of the patent[30]; that the wording in the claims of discharging a stream of oxygen through the slag layer "onto and below the surface of the bath" is not restricted to a non-deep penetration and would include penetration far below the surface of the bath[31]; that the language of "avoidance of material agitation of the bath by the oxygen stream" and "a localized reaction zone spaced a substantial distance from the refractory lining" are not causally related[32]; that the term "localized reaction zone spaced a substantial distance from the refractory lining" could also exist with deep penetration as taught by Schwarz and Miles[33]; that such language as avoidance of material agitation is not supported by any "antecedent language" in the specification[34]; and that because Claims 1 through 4 of the continuation-in-part application expressly *mentioned* the **[21]** avoidance of deep penetration as an essential feature of the claims and were rejected and later cancelled by the applicants, such cancellation amounted to a file wrapper estoppel against the use of such words, even if the applicants had used them in the specification.

Thereafter the District Court discussed and made findings of other matters; the Rinesch and Hauttmann affidavits filed with the continuation-in-part application would not help "persons skilled in the art of steelmaking at the time the invention was made" because such persons would not be responsible for knowing the contents of affidavits filed more than seven years later[35]; and that the term "avoidance of material agitation of the bath by the oxygen stream" was only supported by the specification "in a very limited and meaningless way" and could not have been a meaningful concept to persons skilled in the art at the time the invention was made.[36]

[30] 257 F.Supp. at page 426.

[31] 257 F.Supp. at page 426.

[32] 257 F.Supp. at pages 426 and 430.

[33] 257 F.Supp .at page 426.

[34] 257 F.Supp. at page 429.

[35] 257 F.Supp. at pages 431-432; Compendium X, page 211.

The District Court stated that there was "tangible evidence" in the record tending to confirm that the concept of material agitation by the oxygen stream is a fiction.[37] Thereafter **[22]** it discussed particularly two demonstrations, No. 7 and No. 9, made in the presence of the Court at the Cast Metal Laboratories of the University of Michigan at Ann Arbor; whereupon it made its findings of fact and discredited two of the plaintiffs' expert witnesses from the Massachusetts Institute of Technology, Dr. Shapiro and Dr. Elliott, as the District Court related such testimony with avoidance of material agitation and avoidance of deep penetration.

Dr. Shapiro had testified that chemical force-power resulting from the jet's impingement was 3000-8000 times stronger than the force-power of the jet itself. Accordingly, the District Court stated:

> ". . . as compared with the relatively feeble agitating power of the jet, it seems impossible that a deep penetration by the jet could overcome or even materially affect such circulation, so as to cause a material agitation by the oxygen stream."

It then made a number of findings on Demonstration No. 7 and No. 9.

> Demonstration No. 9 discredited Dr. Elliott's contradictory testimony of deep penetration being 35%-40% of the bath in Demonstration No. 9 and later testified that the penetration in Demonstration No. 9

[36] 257 F.Supp. at pages 431-432; Compendium X, page 189.

[37] 257 F.Supp. at page 433; Compendium X, page 189.

was no more than 1.5 inches of a 6.8 inch bath depth, or approximately 22 percent of the bath depth.[38]

[23] Since Demonstration No. 7 strongly suggests material agitation by the oxygen stream is a fiction, then even under the process taught by Schwartz and Miles, chemical reactions rather than the mechanical action of the jet must have been the actual cause of agitation in the bath.[39]

The claim of circulatory movement in the molten metal produced by chemical reactions in a localized reaction zone is simply not supported by the teachings of the specification of the patent in suit.[40]

The references in the specification do not teach "in so many words" that circulation of the bath is produced by chemical reactions, as claimed.[41]

The plaintiffs' claim of reaction-induced circulation which could only be caused by chemical reactions, "is not the teaching of the specification.[42]

Because the specification teaches only a down in center circulation, the claim which is not limited to any direction of circulation clearly overclaims the specification.[43]

[24] "An 'explosive bubble' mechanism" would tend to justify a conclusion "that reaction-induced circulation in a molten metal bath could only be down in the center" was advanced by two of plaintiffs' expert wit-

[38] 257 F.Supp. at page 435; Compendium XIII, pages 242-243.

[39] 257 F.Supp. at page 435.

[40] 257 F.Supp. at page 436.

[41] 257 F.Supp. at page 437.

[42] 257 F.Supp. at page 437.

[43] 257 F.Supp. at page 438.

nesses but was admittedly not contained in any literature prior to the time of trial.[44]

The plaintiffs engaged in "tortured construction of the specification and claims in the patent in suit in order to find support in the specification for a claim of reaction-induced circulation", when they could have clarified this by a sentence or two in the specification.[45]

The term "blowing onto and below the surface" does not support the plaintiffs' contention of a "practically negligible" penetration of the surface of the molten metal by the oxygen jet because "blowing onto and below" the surface is taught by the Schwarz and Miles patent.[46]

The applicants, when faced with rejection of their claims of "what they regarded [25] to be their invention as unpatentable over the prior art, they unwisely abandoned such claims and instead substituted new claims which were accepted by the Patent Office [and] the new claims failed to point out the actual invention of the patentees."[47]

The claims of the patent do not measure the invention of the applicants or accurately define or correctly describe what the applicants invented; and further, do not clearly distinguish what was claimed before in the art.[48]

Accordingly, they do not meet the requirements of 35 U.S.C § 112, and the patent in suit must be held invalid.[49]

[44] 257 F.Supp. at page 438.

[45] 257 F.Supp. at page 438.

[46] 257 F.Supp. at page 439.

[47] 257 F.Supp. at page 440.

[48] 257 F.Supp. at page 441.

[49] 257 F.Supp. at page 441.

The Suess et al. patent failed "to particularly point out and distinctly claim the subject matter which the applicants regarded as their invention" and as such did not comply with the requirements of 35 U.S.C. § 112.[50]

[26] *The Court of Appeals' Review*

The United States Court of Appeals for the Sixth Circuit, on appeal, agreed with the District Court only on its determination that the Suess patent was invalid [51] and disagreed with it for the most part in all other respects. However, it discussed the reasons why it disagreed with the District Court primarily for these reasons:

The District Court's conclusion of non-obviousness was based entirely upon secondary considerations.

The Court of Appeals was not given a complete determination of the difference between the patent in suit and the prior art, or any findings concerning the level of skill in the pertinent art.

One of the most pertinent prior art patents, the Schwarz patent, was neither recited to nor considered by the United States Patent Office.

Other than the Gerlafingen experiments, the record does not disclose any extensive attempts and failures to refine steel by deep blowing of oxygen between 1946 and 1949.

The success of the Suess patent is made unclear because of arrangements for an exchange as to know-how and engineering knowledge between the various competitors.

[27] The District Court held that the only *difference* between the Suess disclosure and the prior art was

[50] 257 F.Supp. at page 442.

[51] A dissent by Judge Edwards of the panel without an opinion was recorded.

the teaching of "avoidance of deep penetration" as opposed to "deep penetration".

The District Court failed to concisely define the difference between the depth of penetration taught by Suess and the limitation of the depth of penetration clearly defined by Schwarz and Miles.

The Suess patent does not distinguish "avoidance of deep penetration" from the prior art, presumably because it becomes almost impossible to do so.

Because the plaintiffs "have insisted throughout this case that they regard the subject matter of the patentees' invention to be 'avoidance of deep penetration'," which is not contained in the claim and their attempt to incorporate that reference in other language cannot "be interpreted as limiting the penetration of the oxygen stream to a 'practically negligible' penetration."

By the patentees assuming inconsistent positioning before the Patent Office, the patentees failed to define their alleged advantage over the prior art and they attempted to extend their monopoly to something already patented.

[28] In the face of the prior claim references by the patent office, inferences of abandonment can be drawn from the omission of "avoidance of deep penetration" in the claim and the patentees cannot regain the phrase to qualify the effect of their acquiescense through the affidavits because of the file wrapper estoppel.

Since avoidance of deep penentration is *clearly the subject matter* which applicants regarded as their invention, such "avoidance of deep penetration simply cannot be read into the claims of the patent."

The claims speaking of discharging a stream of oxygen vertically downwardly through the slag layer onto and below the surface of the bath at the central portion

thereof . . . is clearly not restricted to a non-deep penetration and could include penentration far below the surface of the bath."

The language of "avoidance of material agitation of the bath by the oxygen stream" and "a localized reaction zone spaced a substantial distance from the refractory lining" are not causally related to "avoidance of deep penetration."

[29] The term "localized reaction zone spaced a substantial distance from the refractory lining" could also exist with deep penetration as taught by Schwarz and Miles.

The term "substantial distance" is not given any definite meaning by the patent.

Claims 1 through 4 of the continuation-in-part application expressly *mentioned* the avoidance of deep penetration as an essential feature of the claim and were rejected and later cancelled by the applicants. Such cancellation in the file wrapper history estops the plaintiffs from reading into their invention the subject matter of "avoidance of deep penetration."

[30] With the condensed versions of the prior courts' opinions before us, it should be easier to pinpoint the report of my inquiry into an analysis of each. My inquiry into these was directed primarily as such are supported by the Suess patent specification and claims in relationship to the prior art Schwarz and Miles patents. And secondly, to the evidence presented in the case. If the Suess patent had a right to validity, it must have been on the basis of its own words. If clarifications were in order, such clarifications could only have been permitted by virtue of applicable patent law.

In holding that the Suess patent was nonobvious and unanticipated, the District Court's theory was that "the specification teaches a circulation brought about by the jet"

and that no reference in the specification teaches "in so many words" that circulation of the bath is produced by chemical reactions.[52] From this the District Court concluded that,

> ". . . plaintiffs are forced to engage in tortured construction of the specification and claims in the patent in suit in order to find support in the specification for a claim of reaction-induced circulation." (257 F.Supp. at page 438).

The Suess specification contains a series of instructions on the character of the vessel to be used, the ratio of the bath [31] depth to bath surface, the nozzle with a specified diameter per ton of charge, the spacing of the nozzle within prescribed limits above the surface of the molten metal bath, the outfitting of the nozzle with high purity oxygen, the directing of the nozzle vertically or nearly vertically at the surface of the bath, the placing of the nozzle centrally to the bath, and in so operating that the area of jet impingement is controlled to produce a relatively confined zone of direct oxygen to metal contact with respect to the total surface area of the bath.[53]

In examining the Suess specification, we see that the patentees assert "it is believed" after applying the oxygen jet in a particular way that it "brings about a flow in the molten metal . . ." and that "this apparent circulation" is facilitated by the shape of the bottom of the vessel.[54] Actually then, this was not an out-and-out declaration, but a belief and was well within the permissible limit allowed by law, since the law does not legally require an inventor to comprehend the scientific principles on which the practical effectiveness of his invention rests. The law is concerned only with the fact that the patent works. An in-

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[52] Compendium VI, pages 117-118.

[53] Compendium V, page 101.

[54] Exhibit PX1, col. 4, lines 27-42.

ventor may be ignorant of the scientific principle or be uncertain about it, or even may be confident and others may think differently. But all of this is [32] immaterial, if by the specification the thing to be done is so set forth that it can be reproduced.[55] Nevertheless, the Suess patenteees did set forth the theory of the functioning of the chemistry upon the impingement of the oxygen by saying that due to the very high affinity of oxygen for iron, the initial contact of the high purity oxygen jet with the molten metal bath causes a rapid combination of oxygen and iron to form FeO in the confined central reaction zone. The action is detailedly set forth thereafter.

The first significant fact is that the reactions immediately develop an extremely high temperature in the zone of direct oxygen contact, and eventually approach the boiling point of iron. By this reaction it is indicated that a portion of the iron oxide *goes* to the slag and a portion *diffuses* into the bath and so forth.[56] The process is fully detailed in the specification thereafter until the flame dies and carbon combustion is completed when the bath becomes relatively quiet and then the oxygen stream impingement is insufficient to cause the continuance of oxygen-metal reactions.[57]

[33] My analysis indicated, and I so reported,[58] that nowhere in the specification is there any statement or inference that the oxygen jet physically induces motion or activity in the bath. But by the very words of the chemistry involved in the production of high temperatures, as well as the fact that the oxidation process is a combustion process and of an explosive nature, the oxidation-reaction provides the first movement in the bath and with it brings the iron

[55] Compendium V, Phy ical-Mechanical v. Chemical, pages 104-105.

[56] PX1, col. 4, lines 43-60.

[57] PX1, col. 6, lines 66-72.

[58] Compendium V, pages 108-112.

oxide to the slag and a portion of it downwardly with chemical expansion which is produced by the process of oxidation. Logical and scientific explanations are discussed in Compendiums V and VI.

Thus, if I am correct, as I am fully convinced that I am, that the specification informs the steelmaker that the first motion or movement in the bath occurs because of chemical combustion and expansion, it would seem that the District Court misread the technical significance of what causes movement or action in the bath and mistakenly arrived at its thinking that the invention if it was to have any success must succeed on the physical aspect rather than the chemical aspect. This is borne out by the fact that the District Court eventually arrived at such a determination.

While the evidence was being presented regarding the differences in the physical processes between the June 17th, 1949 series of tests and those of June 25th, 1949, Dr. Trenkler [34] testified that only two changes were made (1) from a Laval nozzle to a cylindrical nozzle and (2) an increase in the nozzle bath distance from 10 centimeters to 15 centimeters. Without considering the balance of the 250 tests up to November, 1950, the District Court determined "The striking disparities in results of these three series of tests appears to this Court to be attributable solely to the *differences of impact pressure . . .*" (Emphasis added).[59] And it finally said,

> "However, the patentees must be credited with the invention under applicable law, because they took the final step of reducing impact pressure . . . Yet this final step of reducing impact was the difference between success and failure." (257 F.Supp. at page 419).

From various parts of the record, including references to the various claims filed, concerning the wording of "avoidance of deep penetration", the District Court concluded that the patentees seemed to have discovered "an

[59] 257 F.Supp. at pages 411-412.

intermediate degree of penetration between surface blowing and deep blowing",[60] and that this was ". . . the real gist of the invention by the patentees . . ." and "seems to have been unobvious, in view of the apparent failure of steelmakers to observe such limits of penetration while following the teachings of Schwarz and Miles patents."[61]

[35] Thus, we see that what might have been a simple adjustment by any steelmaker had become "the real gist of the invention". I take note of the fact that in addition to the District Court's disregard of the balance of the 250 tests up to November, 1950, that in examining the patent there is no mention either of a cylindrical (regular) or Laval nozzle, nor any teaching that the nozzle bath distance was to be 15 centimeters. This also raised further questions. If these two differences were the only two differences from the prior art, why was there any need for detailed instructions in the specification on how to make and use the patent process? Why did McLouth pay $100,000 for know-how, and why did J & L pay $285,000 for what it said was know-how, especially when they were, as they contend, practicing the Schwarz process? Then, too, if it was only a question of reducing impact pressure of the oxygen jet on the bath surface, why would Dr. Durrer have termed the Suess process a "new metallurgy with which we must first of all become acquainted?" And also, why should the impact pressure have needed only "a polishing up process", as Durrer suggested?[62]

[36] Assuming then that avoidance of deep penetration is the gist of the invention, the specification, itself, must of necessity in clearly related word support this statement. For if the specification does not support it, it would be totally irrelevant in the consideration of the validity of the patent.

[60] 257 F.Supp. at page 403.

[61] Compendium IV.

[62] Compendium I, pages 38-40.

I observed that the word "gist" of the invention seems to be the result of evolutionary thinking in the District Court Opinion. It first came about as a contrast from Miles, where the "gist' of that invention was stated as a penetration of "almost all the fluid into the bath". While in the Suess patent avoidance of deep penetration was stated, in fact, to be the gist of the invention of the patentees. It was finally adopted after the conclusion on "reduction of impact pressure" of the nozzle on the bath.[63] It will be seen that for the most part the District Court attributed its finding to statements made by the plaintiffs' witnesses and the plaintiffs' counsel that the Suess patent avoids the deep penetration prescribed by the prior art and to the lessening of the impact pressure of the oxygen jet upon the molten metal bath. Its sole support in the specification, however, lay in four statements[64] which it extracted out of the context to which they related. Since these are discussed **[37]** detailedly under Compendium II, commencing with pages 77-78. I need only state here that each of these four quoted references presents the necessity for adherence to the instructions in the specification, with results as are distinguished from those in prior art, with the promise it seems that if instructions are followed that the "avoidance of deep penetration" as practiced in prior art with undesirable results will not occur or result in the practice of the instant patent.[65] Thus these four references do not indicate that avoidance of deep penetration is a factor, but do indicate that it is a differentiation from prior art.

Additionally, I have treated elsewhere[66] the statements that the prior claims originally filed and which were rejected or abandoned referred to "avoidance of deep pene-

[63] Compendium IV, pages 97-98.

[64] Compendium II, page 76.

[65] Compendium II, page 91-92.

[66] Compendium IV, page 89-90.

tration" as the subject matter of the invention. When the language in these is pinpointed, it is observed that they do not so read but rather as a circumstance—a result which occurs if or when or while the Suess process is followed.[67]

[38] Both the specification and the claims *ab initio* gave the impression that deep penetration was an unwanted circumstances, which was evidently the thinking of the Primary Examiner in Division Three of the Patent Office who made the determination here and who sought to have the applicants change to more positive language. This was recorded in the file wrapper history. Claim 17 which became the new Claim 1 is made ". . . in view of the conference with the Principal Examiner on June 14, 1957 in order to improve the definiteness of the claim and to eliminate the negative limitation present therein."[68]

At the first post-trial hearing before me on April 29, 1970, Primary Examiner LeRoy so testified. He said "I thought that the language should try to bring out that the oxygen stream was confined or localized in the area somewhere near the surface of the bath. The deep language, the deep penetration, I thought, was well known in the art . . . but if you wanted to define this as being localized, I didn't like the language of 'avoid deep penetration'. So I suggested that they use something to show it was localized in that area . . . and so the language that we finally adopted there was to bring out that feature.[69]

At this point I considered the admissibility of the evidence [39] of the Primary Examiner and of the lawyer who had an interview with him, and concluded that even if the patent is considered a contract, the evidence was not offered for the purpose of changing, altering or modifying the contract, but rather disclosed that the purpose was "to

[67] Compendium IV, pages 89-92.

[68] PX2A, page 98. Compendium II, page 58.

[69] Compendium II, page 59.

improve the definiteness of the claim and to eliminate the negative limitation present therein." Also in this connection, it was disclosed that no positive part of the subject matter was abandoned or relinquished by the applicants, nor that the Primary Examiner had intended in any way that they should do so.[70] Furthermore, the patent examiner was not concerned with any similarity in the instant patent application with the prior art, but rather with the words which expressed the theory and difference from the prior art.[71]

Further, the McLouth record, by reason of the *sua sponte* determination, indicates that the plaintiffs had no notice that this would be determined, especially in view of the fact that the defendant neither raised this point as an issue in the pleadings or at the trial of the case. This became the more crucial eventually reason of the added estoppel limitations set forth in *Blonder-Tongue*. I held therefore that the plaintiffs had presented [40] substantial evidence that without fault of their own, they were deprived of a fair opportunity to present evidence on the issue of file wrapper estoppel. Accordingly, the defendant was not entitled to the defense of the doctrine of file wrapper estoppel.

[41] **Localized Reaction Zone**

As relates to the District Court's determination that the localized reaction zone had been anticipated by and was obvious to both Schwarz and Miles, and furthermore that it was a fiction, the first distinction lies in the fact that Schwarz and Miles placed the localized reaction zone within the bath and were unable to prevent damage to the refractory walls. By injecting the oxidizing gas or liquid, Schwarz and Miles provided an elongated, circular oxidizing instru-

[70] Compendium II, page 58-59.

[71] Compendium II, page 61.

mentality not only in the center of the bath but from the surface downwardly or angularly, depending upon how it was practiced, and a high temperature was created along its entire circumferential length.[72] By this process, on the other hand, it was neither localized nor controlled. The Suess process, on the other hand, by its instructions provided for a hot spot at the surface center of the bath, where the oxidation process was localized and controlled, and at a point away from the bottom and walls of the refractories thus eliminating a potential danger to them.[73]

So while the Schwarz and Miles process provided for an unrestricted and uncontrolled single acting high temperature device or devices, the Suess process provided in its specification for a dual process in which the oxygen impingement on the metal bath produced two different chemistry phases: first, the exothermic or heat producing phenomenon at the surface center of the bath where high temperatures were generated and activity or movement was initiated; and second, the endothermic (heat absorbing) phase **[42]** within the bath, by reason of the movement of the boiling iron from the hot spot or localized area downwardly into the bath where the high temperatures were diffused.[74]

[43] Double-phased chemistry was evidently not considered by the McLouth District Court, since the Opinion does not even mention it. Elsewhere I found that the localized reaction zone was actually the key which opened up the Suess process in accordance with the instructions set forth in the specification, and that this produced "a sufficiently high reaction velocity of the oxygen with the bath constituents to insure the development of autogenous heat . . . consistent with controlled temperature and control and development of other necessary required process condition, such as fluid slag, avoidance of over-oxidation (undue loss of iron to the slag), and the avoidance of slopping."[75]

[72] Compendium VII, pages 156-158.

[73] Compendium VII, pages 148-149.

[74] Compendium VII, pages 150-155.

If the localized reaction zone, then, is read out of the specification, then the production of the "sufficiently high reaction velocity of the oxygen with the bath constituents" providing the necessary autogenous head and control and development of other necessary required process conditions, to which Dr. Durrer ascribed his idea of the new metallurgy, might also be read out of the specification, and then the words of the District Court would be realistic that "the localized reaction zone . . . could also exist even with deep penetration." For then we would be seeing the Suess patent eliminated and steelmen would be back to the prior art of Schwarz and Miles.[76]

[44] Then in accordance with the District Court's pronouncement that Schwarz and Miles also practiced the localized reaction zone, there was a failure to observe that Schwarz and Miles placed the localized reaction zone inside of the bath, where it was unlimited and unconfined.[77] Whereas in Suess, it was confined and localized at the central surface of the bath.[78] Under these circumstances, it would seem that the District Court would have misread the specification.

As for the District Court's assertion that the localized reaction zone was not supported in the specification, an abundance of detailed supports are set forth in Compendium VII, page ——.

[75] Compendium VII.

[76] Compendium VII.

[77] Compendium VII, pages 149-150.

[78] Compendium VII, pages 152-153.

[45] **Substantial Distance**

The District Court criticized the words "spaced a substantial distance from the refractory lining" as this term modified the words "in a localized reaction zone," in Claim 1 of the Suess patent "as not giving any definite meaning for the patent in suit." In Compendium VIII, I explained that the word "substantial" is susceptible of different meanings according to the circumstances of its use; that specified instructions place it at the central surface of the molten bath and provides for the character and force of the jet impingement, and as well for the vertical and central jet placement within limits above the bath. In any event, the McLouth District Court answered that criticism when it held that "The specification gives the term (localized reaction zone) no specific meaning or definition at least in terms of numerical percentage of bath area of depth" and made clear what the size of the reaction zone must be so as to prevent "excessive refractory damage either to the bottom or walls of the vessel." Furthermore, it did "not prevent a steelmaker from making and using the invention on the basis of the disclosure of the specification."[79]

[46] **Onto and Below the Surface**

As for the criticism of the McLouth District Court, that the words "onto and below the surface of the bath" were overbroad, I pointed out that the District Court itself had said that the patent ". . . in several places uses the term 'some penetration' but not 'deep penetration'."[80] It also knew that the simple blowing upon the surface forms an indent from shallow to deep.[81] Further, it suggested that the word "below" would seem to cover even a deep penetration of the bath by the oxygen stream "which is certainly not taught by the specification."[82] The District Court refused to accept the argument of plaintiffs' counsel that "avoidance of deep penetration" means a "practically negligible penetration of the surface of the molten metal by the oxygen jet."[83]

The answer to the District Court's criticism is (1) that the word "below" does not necessarily mean deep[84]; (2) that the two words are used conjointedly and when two words such as "onto and below" appear in combination they must be read together within the framework of the specification itself[85]; (3) that under the rule of *noscitur a sociis*, the meaning of the doubtful word may be ascertained by reference to the meaning of words associated with it, thus these words take color from each other and other [47] associated words and convey technical significance to the subject matter of he claims[86]; (4) that a reasonable construction of the claims and specification clarifies the term, particularly when there are abundant references which give it meaning[87]; (5) the blowing of the jet upon the liquid bath in creating some denting or hollowing of the surface no matter how trivial providing a concavity literally dips lineally below the surface[88]; (6) the chemical inter-penetration and combination of the oxygen and iron literally give meaning to the words "onto and below" because it breaks the surface linearity[89]; and (7)

[79] Compendium VIII, pages 167-174.

[80] Compendium IX, page 181.

[81] Compendium IX, page 182.

[82] Compendium IX, page 175.

[83] Compendium IX, page 175.

[84] Compendium IX, page 175-179.

[85] Compendium IX, page 175-178.

[86] Compendium IX, pages 177-178.

[87] Compendium IX, pages 181-182.

[88] Compendium IX, pages 178-184.

[89] Compendium IX, pages 184-187.

that a person skilled in the art will understand the term by reason of the variety of explanations on the instructed impingement of the oxygen jet on the surface of the bath, and so will understand how to project or discharge the oxygen upon and below the bath surface and thus produce the steel promised in the patent without unduly damaging the refractory lining of the vessel.

[48] Material Agitation

The McLouth District Court criticized considerably the term "avoidance of material agitation."[90] The word "agitation" appears only twice in the patent: once in Claim 1 and once in the specification. In the specification it is used in a two-fold sense: first, a resulting activation caused by the rapid formation of carbon monoxide, and second, the causative increased activation of the circulation already existing in the bath. The specification states that the "reaction of carbon with the FeO and directly with the oxygen gas in the confined direct oxidation zone causes rapid formation of carbon monoxide . . . [which] . . . causes a strong boil or agitation of the bath," and that this augments the bath circulation to continuously present unrefined metal to the oxygen gas reaction zone, and so forth. Thus the word "agitation" finds itself identified as a chemical result and in turn as a physical impetus to the already existing circulation in the bath. On the other hand, the word "agitation" in the Claim is involved only in its physical sense. It is not an instruction or explanation of how to make the Suess process functionable, but rather of how *not* to interfere with its functioning as it was taught in the prior art.[91]

[49] The prior art taught that the physical application of the oxygen jet "in the manner of a solid body" or by

[90] Compendium X, pages 188-190.

[91] Compendium X, pages 191-192.

liquid oxidizers would provide the agitation or stirring action within the interior of the bath in order to bring about chemical results.[92]

The word "turbulence" was used in the specification but it was used in the sense of bath activity, chemical reaction or chemical combustion, and used to state that when the carbon oxidation was complete, the ignition and visible flame commenced within the first minute of blowing came to an end and the bath became relatively quiet because the "turbulence of the bath and slag due to the oxygen stream impinging" could no longer have any chemical reaction or turbulence effect—because combustion had been completed.[93]

Further, the District Court evidently keeping in mind that the specification asserted that the oxygen jet produced the circulation in the bath, and that the adjustment of the oxygen jet actually was the gist of the invention, was unable by this thinking to separate the significance of chemically induced circulation or **[50]** reaction or turbulence, and gave them all an identity of meaning, as is evident by the fact that it used them interchangeably as actions in the bath caused by deep penetration and as circulation or action in the bath caused by chemical reaction.[94]

Although the District Court eventually ruled that the term "avoidance of material agitation" could not have been a meaningful concept to persons skilled in the art at the time the invention was made, it was contradicted by the District Court itself when it found that ". . . the specification of the patent in suit . . . nevertheless complies with Section 112 by disclosing the invention in sufficiently clear terms to enable steelmakers 'to make and

[92] Compendium X, pages 192-193.

[93] Compendium X, pages 198-199.

[94] Compendium X, page 199.

use the same'."[95] Also, while the District Court made the finding that "avoidance of material agitation" has no causal connection with the term "avoidance of deep penetration," it nevertheless stated that "The Rinesch and Hauttmann affidavits in 1957 attributed . . ." such a causal connection. But still in all, it was not shaken from its belief that avoidance of deep penetration is the gist of the invention," and it found no "clear connection" of this to "avoidance of material agitation, because the **[51]** applicants could have provided more suitable words to the patent efforts.[96]

I am convinced that because of the overall meaning which the District Court gave the word "agitation" as including bath action, reaction, circulation and turbulence, it possessed no technological comprehension of the significance of each as the Suess patent set them forth and explained them. Thus a conflict was formalized between the significance of the term "avoidance of material agitation" and the term "avoidance of deep penetration."

While it is apparent to me that to some extent the plaintiffs' experts (as well as the defendant's experts) failed to adequately explain both the factual and scientific factors involved, as is frequently seen from the manner in which the word "agitation" was loosely used in the questions and answers as presented before the District Court,[97] I observed with what exclusivity the patentees chose their own words or phrases, as for instance "impinge," "surface," "reaction," "high temperature" and "circulation." I observed, too, that the word "turbulence" was used only once and that the word "agitation" was used only twice. Thus it was significant that the patentees chose words **[52]** which would best explain the

[95] Compendium X, page 207.

[96] Compendium X, pages 200-201.

[97] Compendium X, pages 219-220, 222-228.

circumstances and their environment. When it used the word "agitation" in the Claim it did so in the sense of actuating, provoking, stirring or prodding into action and in its negative and cautionary sense. In the environment in which the word "agitation" was used in the Claim, there is seen at once the limiting or preventive activation or stirring of the bath by the oxygen stream, and it becomes quite obvious if we hypothetically and experimentally substitute the word "stirring" for the word "agitation" in the claim, the significance is unmistakable.[98] And although the District Court criticized the use of the word "agitation" as being "an obvious attempt to distinguish the Miles patent," no blame should be attached to the patentees for so doing, because the law requires that the claim distinguish the instant patent from the prior art.[99]

As for the District Court's use of the word "agitation" interchangeably with action, circulation or turbulence in the bath, the District Court found corroboration for its thinking that "agitation" was the sum total of activity in the molten metal bath while it was in the process of oxidation reaction in particularly **[53]** one of ten demonstrations which were carried on before the Court by the defendant at Ann Arbor, Michigan. Here the District Court interchanged the significance of the word "agitation" with throw-out from the converter. I treat this matter separately later.[100] By the expression of the District Court regarding this "throw-out," it was obvious that because the difference of the activity within the bath during the functioning of the chemical process could not be visibly distinguished or sensed from the "stirring" function by the operator, there was confusion as to the significance of both and a failure of conception of their difference.[101]

[98] Compendium XII, page 226.

[99] Compendium II, page 71.

[100] Compendium VIII, page 233-284.

[101] Compendium VI, pages 122-123.

The District Court also criticized the use of the word, "avoid material agitation" because, as it had already found previously, the specification presented a physical creation of circulation by the oxygen, and that by the use of this term the applicants were attempting to change to a chemical theory of physical circulation. As already explained, this may merely be said to be an assmption without basis in fact. From all of this we are reminded that the applicants throughout their specification and claims made it clear that they did not have a theory of "agitation", but one of "circulation" caused by the chemical [54] reaction originating in the localized reaction zone at the place of impingement of the oxygen to metal. As for the reference "to such an extent as to avoid material agitation" this does not appear to be an instruction of how to make the Suess process functionable, but rather of how not to do it, as it had been done in the prior art.[102] Thus it is obvious that the word "agitation" as contained in the phraseology or terminology of the claim is not fictional but has substantial significance to persons skilled in the art of steelmaking to abide by the instructions contained in the specification and not to apply the oxygen jet physically as was the custom in the prior art.[103]

With the explanation of the two-phase character of chemistry action in the bath, of exothermic in the top surface center, the plaintiffs' experts in reality were saying that any application of the jet which would physically interfere with the localized reaction zone would be considered as blowing the oxygen jet to such an extent as would materially agitate the bath; for then the exothermic chemistry would be interferred with, overcome or upset, and the localized reaction zone would no longer function, or be handicapped in functioning as the Suess process contemplates.

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[102] Compendium XII, page 232.

[103] Compendium XII, pages 230-232.

[55]

3000-8000 to 1

The District Court found that "on the basis of the plaintiff's own testimony the concept of material agitation of the bath by the oxygen stream is purely fictional." "The basis" seems to be the District Court's interpretation of what Dr. Ascher H. Shapiro, Professor of Mechanical Engineering at Massachusetts Institute of Technology, plaintiff's witness, testified to that the force of chemical reactions in the bath would be "roughly 3000 times stronger than the force of the jet blowing vertically from above . . ."[104] And later, Dr. Shapiro said that the power of the chemical force was 8000 times stronger than that of the jet. Thereupon the McLouth District Court wanted to know how the one unit of "material agitation of the bath by the oxygen stream" could possibly interfere with a force that was 3000-8000 times stronger than it.

Dr. Shapiro, a specialist in the field of dynamics presented evidence for the purpose of showing what caused the circulation in the bath, mechanical or chemical. In explaining what caused the circulation in the bath, he arrived at two units, one of force and one of power. He made no mention at this time of any potential application of the jet to the agitation of the bath. His evidence opposed that of the McLouth expert who attempted to show that the circulation was produced by the jet and thus physically it was upward in the center. He calculated that the total frictional force applied by [56] the jet was 6½ pounds; that its downward force was in the neighborhood of 350 pounds, which could only produce an indent and could not produce motion in the bath, and so it had no

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[104] Elsewhere he does discuss the primary carbon monoxide bubble created in the hot temperature zone (the exothermic action) as shooting explosively downward, and the later (endothermic action) neucleation of secondary bubbles at the bottom and walls of the vessel which gives buoyancy to the liquid in the bath and moves the liquid upwardly, and so aids circulation within the bath.

potential for producing circulation in the bath as was claimed by the defendant, McLouth.[105]

With some little chemical understanding of what the specification recites on the chemistry of the process (col. 4, lines 43 et seq.), we comprehend that there are no antagonistic forces working against each other by the physical action of the oxygen jet and the chemical action which it in turn generates.

In a ladle-rudder exhibition at Linz, Austria, as reproduced in a movie,[106] I saw the oxygen turned on and off. When the oxygen was turned on, the combination-conversion started and out-throw resulted; when it was turned off, the oxidation-combination stopped and the out-throw abated. What we see in this process is a "before and after" marriage symbol by which oxygen on the one hand and iron, silicon, phosphorus and so forth on the other hand become atomically united and combined. Take for instance the ordinary household match. Innocuous as it lays [57] undisturbed, but when its head is rubbed to such an extent as to become heated in the presence of oxygen (air), it bursts into flame. The oxygen which is consumed by this combination from the air is an infinitesimal quantity compared to the flame to whose generation it gave itself. So in the molten metal bath when the oxygen impinges upon the molten metal, most of the oxygen in the jet becomes chemically converted and disappears in its elemental state as oxygen. Thus the answer to the District Court's posed query is that the Suess process' one unit of physical force-power of the oxygen jet does not overcome the 3000-8000 units of chemical force-power, but rather generates it and combines with it as the process proceeds.

While this might have given the District Court some clarification of its misconception of what caused physical

[105] Compendium XI, pages 215.

[106] Compendium XI, page 216-217.

material agitation in the bath as against chemical action, Dr. Shapiro's testimony seems to have miscarried because first, his testimony never contained any statement regarding "material agitation" of the bath, and second, because his testimony related strictly to the dynamics by which circulation in the bath could occur, either mechanically or chemically.[107] However, it is evident that Dr. Shapiro's testimony alone wasn ot the real "basis" for the [58] District Court's conclusion regarding "material agitation of the bath by the oxygen jet" as such terminology was interrelated with the words of the claims by what the District Court concluded from Dr. Elliott's testimony.

[59] **Ann Arbor Tests**

The District Court stated that ". . . tangible evidence in the record tending to confirm that the concept of material agitation by the oxygen is a fiction" and thereafter proceeded to discuss three of a series of five tests which had been conducted by the defendant's expert at Ann Arbor, Michigan before the District Court.

The defendant in support of its contention that it was practicing the deep penetration of the prior Schwarz art, submitted the Ann Arbor demonstrations for the purpose of showing the effect upon steelmaking and steelmaking equipment of varying depth of penetration and a method of measuring penetration.[108]

The "tangible evidence" in the record consists primarily of what the District Court extracted as being "tangible evidence" principally from Demonstration No. 7. Here the same fifteen inch vessel containing about 270 pounds of iron was used for the demonstration. After two minutes of supplying the oxygen at the rate of 20 psig, the pressure was increased to 40 psig until the carbon end

[107] Compendium XI, page 215.

[108] Compendium XIII, page 233.

point occurred. The District Court described the [60] physical results when it said ". . . large amounts of slag and metal were thrown up and out of the converter onto the floor, indicating a violent agitation of the metal bath". Then it concluded "In other words, the 'agitation' of the bath as shown by 'throwout subsided . . ." Thereupon it found this as a fact:

> "If the bath agitation caused by such throw-out metal and slag had been caused by the mechanical action of the oxygen stream alone, the throw-out would not have ceased as it did near the end of the blow. It is obvious, therefore, that the action of the oxygen stream alone was not responsible for the agitation of the bath causing throw-out of metal and slag during the major part of the blow." [109]

By these statements we see, first, that the word "agitation" encompasses the word "turbulence" as it was used in the specification (col. 6, line 69), as the total action of the bath during the course of the process, and that this was synonomous with "throw-out". We see also that in this connection it describes the total chemistry action in the bath during the processing, and as such, it has no relationship to the physical character of the word "agitation" as described in the claim. Thus a comingling of the functions of these seems to show a lack of the comprehension of the difference between them. [61] First, the specification never indicated that the oxygen stream was in any way physically responsible for the activity in the bath, but rather maintained throughout that action, movement or circulation was produced as a result of the chemical reactions in the bath. And second, the very thing which happened in Demonstration No. 7 upon the completion of the carbon combustion is what the specification describes will happen in the practice of oxygen application on the surface of the bath "When the flame dies and carbon combustion is completed, the bath becomes relatively quiet and intimate contact between slag and metal bath ceases. The turbulence of the bath and slag due to the oxygen stream impinging from directly above is insufficient to cause continuance of oxygen-metal reactions." (col. 6, lines 66-69). In other words, it was as if this reference did not exist, and the District Court discovered it for itself in observing Demonstration No. 7. Thus its reliance on Demonstration No. 7 as "tangible evidence in the record tending to confirm that the concept of material agitation by the oxygen is a fiction" is misconceived and misplaced. This is so also by reason of the fact that the defendant did not offer these demonstrations in [62] evidence for the purpose of contradicting the fiction or non-fiction of avoidance of material agitation, and yet the District Court adduced this as a factual finding. There are other reasons why I believe that Demonstation No. 7 does not present "tangible evidence in the record" and it is necessary that these be enumerated.

[109] Compendium XIII, page 259.

Another pertinent test at Ann Arbor was Demonstration No. 9, purporting to show that it was the oxygen jet which burned the hole through a prepared refractory bottom brick.[110] The bottom refractory brick had been bored leaving a thickness of 15/16th of an inch from the bottom. The demonstration started with a pressure of 20 psig and that was raised after two minutes to 40 psig. According to defendant's expert, Dr. Flinn, the oxygen jet burned the hole through the refractory and in the molten metal[111]. He said that forty seconds later he saw "the *gas jet* coming through the bottom *in the form of a flame*".[112] He said that the "flaming gas jet" coming through the bottom proved that "the jet penetrates through the bottom".[113] He said it came

[110] Compendium XIII, page 235.

[111] Compendium XIII, page 235.

[112] Compendium XIII, page 236.

[113] Compendium XIII, page 237.

through for about ten seconds until the pressure was cut back to ten psig. After the pressure was lowered, he saw a metal stream **[63]** coming out, and when the pressure was raised again to 40 psig, they again saw the flame coming through the bottom. The pressure was then shut off and the rest of the metal or most of it ran through the hole.[114]

Oxygen is Invisible and Does Not Burn

Dr. Elliott for the plaintiffs testified that the oxygen did not cause the hole in the bottom and that it was the downwardly moving stream saturated with carbon and oxygen which burned the hole through. Although Dr. Chipman, another plaintiffs' expert, said that it was silicon and oxygen which combined in the metal to form silica and became destructive to the bottom refractory as it struck.[115] Whether it was the carbon monoxide burn-through or the silicon burn-through, it was not questioned or discussed by the District Court, and is in effect an immaterial issue here.

What is meaningful here is that the defendant's Vice-President of Engineering, Lyle Johnson, testified that in the test where they blew oxygen into an empty vessel on bare brick which was heated to a temperature of 2000 degrees, the test **[64]** "proved that oxygen by itself will not burn a hole in the brickwork". McLouth's General Superintendent of the Hot Metal Division, Mr. Paul Lindberg, also contradicted Dr. Flinn's assertion by his testimony when he said that the marking on the bottom of the vessel "is caused by the metal of extremely high temperature hitting the bottom".[116] But what is more incredible is that Dr. Flinn says that he saw a jet of oxygen extruding from the bottom of the refractory "in the form of a flame". If it was a flame, then it was the combustion of oxygen with

[114] Compendium XIII, page 237.

[115] Compendium XIII, page 238.

[116] Compendium XIII, at page 239.

some one or more of the oxidizable impurities contained in the bath, whether of silicon, manganese, carbon or other impurities. The point is that we cannot see oxygen as is obvious when we look at its one-fifth content in the air. It will not burn even though it, itself, supports the combustion of substance. So that when Dr. Flinn said it was "visible" that it was a "flame" coming through the bottom, he saw the combustion process of burning gases or a flame, which in this case was described as having a "bright orange-red" color. Such a flame was colored by energized ions emitting light energy, as well as by bits of solid material heated to incandescense by the reaction energy.[117] Thus the burn-through was not caused by the oxygen jet, but by flame, fire or combustion, and thus Dr. Flinn's testimony in connection with these tests becomes objectively discredited as "tangible evidence in the record".

[65]

Demonstration Steel Quality and Nozzle and Refractory Damage

Another distinct difference between the Michigan demonstrations upon which the District Court relied as "tangible evidence in the record" is that while Dr. Flinn testified that in Demonstration No. 5 the steel produced had the characteristic of ductility, and in Demonstration No. 7 "We have bottom burning but we still have steel", and of no description of the quality of steel blown in the 185 seconds of Demonstration No. 9, the significance is that there is nothing in the evidence by McLouth that particularly Demonstrations Nos. 5 and 7 produced steel equal in quality to that obtained by McLouth in its OP-1 and OP-2 shops.[118] And even more important, there is not a single word in the McLouth Record that the resultant products from these Ann Arbor demonstration produced "steels having analyses

[117] Compendium XIII, at page 240.

[118] Compendium XIII, page 248.

and qualities at least comparable to that of the basic open-hearth steels" as is the object of the Suess process.[119] Finished steel has a variety of virtues depending upon the applicability of its use. However, strength is steel's primary virtue.[120]

In the case of Demonstrations Nos. 5 and 7, while we are informed that the silicon and "most of the manganese have been eliminated", we are told nothing about sulphur and phosphorus removal.[121] In addition to the lack of the description of the [66] products produced in these demonstrations Nos. 5 and 7, no information is given on nozzle and refractory damage as these might or might not show comparability to the OP-1 and OP-2 operations at McLouth, and of the Suess process operation. In any event there is no doubt that the Ann Arbor demonstrations were not models of the Suess process, or examples of the process as it was described and intructed in the Suess specification. The most important circumstance is that of incomparability of the alleged model demonstrations with the realities of the Suess conditions.

[67] *Dr. Elliott's Credibility*

The "tangible evidence" is supported, not by the defendant's expert witnesses, but by the discrediting of the plaintiff's expert witness, Dr. Elliott. Although several statements are made in the District Court Opinion regarding the inconsistencies or contradictions of Dr. Elliott's testimony, such as that Dr. Elliott relied on the quieting of the bath at the end of the blow as a sign of avoidance of material agitation of the bath by the oxygen stream, which I discuss in another related matter,[122] two important criticisms leveled

[119] Compendium XIII, page 249.

[120] Compendium XIII, page 250.

[121] Compendium XIII, page 248.

[122] Compendium XIII, at page 257.

against Dr. Elliott by the District Court relate to Demonstration No. 9 as assumedly being "tangible evidence".[123]

The first discredit attributed to Dr. Elliott was that he ". . . defined deep penetration by reference to such bottom damage . . . when the jet enters more than say 35 to 40 percent of the bath depth . . . [and] would have regarded the penetration in demonstration No. 9 as being at least 35 to 40 percent of the bath depth. Yet he later testified that the penetration of the jet in Demonstration No. 9 was no more than 1.5 inches of a 6.8 inch bath depth, or approximately 22 per cent of the bath depth." The difficulty with this statement by the District Court is that it was apparently not aware of the fact that it was comparing two different sets of circumstances, like the proverbial apples and oranges.

[68] *35-40 percent or 22 percent*

On the basis of the "tangible evidence", Dr. Elliott a plaintiffs' expert witness, is discredited not only as his testimony related to Demonstration No. 7, but also as it related to Demonstration No. 9. The District Court stated "Dr. Elliott himself relied on the quieting of the bath at the end of the blow as in Demonstration No. 7 as the sign of avoidance of material agitation of the bath by the oxygen stream." What Dr. Elliott was testifying to was that McLouth in the operation of its oxygen plants was operating so as to avoid material agitation of the bath by the oxygen stream. He said that they were pointing the jet vertically and centrally on the surface of the bath; that there is no deep blowing or penetration of the oxygen into the bath; that at the end of the bath there is a quieting because the chemistry which caused the agitation [not material agita-

[123] This conclusion is taken out of context from the testimony as a whole by Dr. Elliott who was presenting a series of reasons why in his opinion McLouth was practicing the Suess patent and was avoiding the material agitation of the bath by the oxygen stream, as was done in the prior art. (Compendium XIII, page 242-47).

tion] or chemical action in the bath diminishes; and that the jet which is blown heavily presents only a small force or trivial force as compared to the chemical action or agitation.[124] Dr. Elliott cites other points but these are not material here. What is noticeable is that Dr. Elliott used the word "agitation" in connection as it reflected chemical action in the bath, and this may have misdirected the District Court into making the statement that Dr. Elliott relied upon quieting of the bath at the end of the blow as a sign of avoidance of material agitation of the bath by the oxygen stream. Taken in its full context, it may or may not **[69]** have been a misconception attributable to Dr. Elliott's testimony.

The first completely different set of circumstances to which Dr. Elliott testified related to his opinion of the Suess specification of allowing not more than 35-40 percent of the bath depth. The second and completely different set of circumstances related to that existing in Demonstration No. 9 where he testified that "The indent under these blowing conditions would range from between 6/10 of an inch to approximately 1½ inches, 6/10ths of an inch to approximately 1.5 inches."[125] From this second set of circumstances, the District Court estimated his statement to be about 22 percent depth of penetration. By relating the two different sets of circumstances and interpreting them to be directed only to the circumstances of Demonstration No. 9, a highly technical oversight occurred.

From a review of the conditions provided in the Suess specification instructions[126] and their comparison with the Ann Arbor demonstrations' circumstances,[127] we see an enormous difference. Because of the wide variation of the

[124] Compendium XIII, at page 257.

[125] Compendium XIII, at pages 242-243.

[126] Compendium XIII, at pages 245-246.

[127] Compendium XIII, at page 246.

nozzle diameter in the Ann Arbor tests, alone, we see the facility for introducing 58 times as much oxygen into the bath in Demonstrations Nos. 5, 7 and 9 as was prescribed by the Suess specification.[128] **[70]** Accordingly, I believe that there was a failure of identity recognition between the two, that is of the prior testimony of Dr. Elliott in testifying to the allowable limits of penetration under the Suess process and his testimony under the Ann Arbor demonstrations, such as would have mislead the District Court into a pronouncement and finding which was crucial under the circumstances.

In any event, the circumstances of the Demonstrations Nos. 5, 7 and 9 as made would disqualify them as competent evidence in the case on the technicality involved. Accordingly, by reason of such misunderstanding, the expert, Dr. Elliott, should not have been charged with a discredit in this connection and in justice it should not have been used even as a fractional support for a judicial observation that the Ann Arbor Demonstration No. 7 was to any degree "tangible evidence in the record tending to confirm the concept of material agitation by the oxygen stream is a fiction."[129]

[71] **Up and Down at the Same Time**

The second discredit ascribed to Dr. Elliott related to his testimony that "deep penetration causes an up in the center circulation which may cause refractory wear on the walls near the bath surface" as against his testimony, when he said that deep penetration causes bottom damage to the refractory as the result of a downward moving stream of hot metal in the center of the bath. The District Court concluded from this that "Clearly circulation cannot be both up and down in the center at the same time.[130]

[128] Compendium XIII, at page 246.

[129] Compendium XIII, at page 247.

[130] Compendium XIV, page 271.

This was another case of matching two different sets of circumstances. In the first Dr. Elliott was explaining the chemically induced circulation which resulted by following the instructions contained in the Suess patent specification and the advantages of such a circulation as promised by the Suess patent from chemical reactions.[131] This was contrasted against mechanical circulation which was produced by deep penetration of the oxygen jet into the bath, as in the case of the prior art and the effects which it produced not only by reason of interference with the chemical process as prescribed by Suess, but also as relating to damage to the refractories. In chemical functioning, he explained that the Suess patent eliminated the stirring action produced by the jet in deep penetration; that as a substitution for such stirring action, Suess provided for having a chemically **[72]** produced circulation initiated at the central surface of the bath. He explained how the prior art of deep penetration produced unwanted mechanical action in the bath and produced resultant effects, but that in the case of the Suess instructed chemically-circulated action downward into the bath, the bottom and sidewall refractories were protected. He explained that the deep penetration mechanically forced the circulation up in the center backwards, outward on top to the side; that the hot metal was quickly carried to the walls of the refractory and so damaged them. Whereas under the Suess instructions, the hot metal circulated downwardly to the bottom, outwardly to the sides, upward at the sides and then back to the center surface; and that this permitted the hot metal to throw off heat, while so circulating.[132]

From my inquiry into this subject matter and more on the basis of common knowledge rather than of any knowledge of physics, my study shows paradoxically that ". . . circulation [can] be both up and down in the center at the

[131] Compendium XIV, page 272.

[132] Compendium XIV, page 271-273.

same time", in a molten metal bath which is activated by an oxygen blow. This is true especially where the oxygen is charged by a centrally and vertically placed oxygen jet directed to the surface of the molten metal bath.

[73] There can be no argument that the oxidation-reaction process produces an upward out-throw as was described by the District Court in its observation of the demonstrations carried on before it at Ann Arbor, Michigan. In spite of the fact that the District Court mentioned the "explosive bubble mechanism" [133] which showed the movements both upwardly and outwardly from the bath and at the same time downwardly into the bath to the bottom and outwardly to the walls, upwardly towards the surface and inwardly thereafter, there was presented into evidence a series of explosions produced by squibs and oxyacetylene, all of which presented the same character of throw-out and movements in the bath, both up and down at the same time. These, however, were not mentioned and presumably not considered by the McLouth District Court.

And yet comparing these demonstrations as they were produced at the McLouth trial (and as they were produced before me in these J & L actions), it is remarkable how these demonstrations reflect words of the specifications which explain in col. 4, beginning with line 43 the reaction in various steps of the Suess chemical process.

[74] However setting this aside, and even for the moment disregarding the testimony of the experts that the ignition and combustion in the bath produced by the oxygen contact with the metal, produced explosive activity and motion in and out of the bath, I relate this to the principle of action and reaction based upon the theory of Newton's Third Law of Motion which reads: "Action and reaction are equal and opposite." [134] When a bullet is fired from a

[133] Compendium XIV, page 276.

[134] Compendium XIV, page 281.

gun, it also produces a backward force on the gun.[135] The law of motion and recoil holds true particularly in an airplane with jet engines or rockets. It is the exhaust and forward motivation by which the hot gases are ejected and which gives the engine or the rocket its forward thrust.[136]

In the case of Demonstration No. 9 a particular shallow bath of 6.8 inches with the capability of introducing 58 times as much oxygen into the bath to a 22 percent depth might indeed be close enough to bring the high temperatures which the oxidation-reaction created in direct contact with the refractory and damage it. I noticed, however, that the District Court Opinion does not set forth any contradictory evidence by any of the experts, and particularly that where deep penetration occurs, the sidewalls at the [75] interface are not damaged.[137] On the contrary I observed that the evidence of one of McLouth's experts, Dr. Robert Pehlke, an associate professor of Metallurgical Engineering at the University of Michigan, testified that he saw upward circulation in the bath in a demonstration which he carried out. Thus, when the plaintiffs say that when the jet is placed low in the bath, as practiced by the prior art of Schwarz and Miles, the result produces a mechanical motion or movement upward in the center. There seems to be no disagreement on the part of the defendant on this point.[138] On the other hand, there was never any disagreement by the defendant with the plaintiffs that when the oxygen made a surface impingement sufficient to combine with the impurities of the bath, no damage resulted either to the bottom or the sidewall refractories.

In any event, all of this is of a scientific nature and whether the Suess patentees knew how and why their

[135] Compendium XIV, page 281.

[136] Compendium XIV, page 281.

[137] Compendium XIV, pages 273-282.

[138] Compendium XIV, page 274.

patent worked, as indeed it did, it was not required of them that they know; all that was required of them was that they produce a working patent. Therefore, what I have here discussed was not whether [76] the patentees really understood the how and why of their patent's scientific workings, but only for the purpose of ascertaining whether or not there was any misconception of the scientific values or any misinterpretations of the specification or of the expert testimony, which may have unjustly formed the basis of the final determinations of the prior McLouth Courts.[138]

[77] As relates to the District Court's criticism of Dr. Elliott, the opinion mentions nothing about a weighing of the credibility factor of Dr. Flinn's expertise as against that of Dr. Elliott. The findings were based only upon the District Court's own perceptions and conclusions as drawn from its observations of Demonstrations Nos. 5, 7 and 9 with discredit to Dr. Elliott's expert testimony.[139] If, therefore, the District Court's perceptions were misconceived or even lacking in conception or perception, without fault on the part of the plaintiffs, and if such mislead the Court of Appeals, then such findings in the District Court opinion would in these cases before me present circumstances which I would be compelled to consider on the question of whether or not it would be unjust and inequitable to stop the plaintiffs from proceeding in these actions.

Since the District Court would not give credit to the explosive bubble demonstration advanced by the plaintiff, because it "was admittedly not contained in any literature prior to the time of trial", counsel were encouraged to present published [78] literature on any relevant statistical or scientific matters, and graciously responded with an abundance of literature broadly relating to the subject matter.[140]

[138] Compendium XIV, page 283.

[139] Compendium XIV, at page 282.

[140] Compendium XVII, at page 357 Compendium.

Because of this help and of my own sparse knowledge, the chemistry and physics involved in the process, not only of Suess but of Schwarz and Miles as described in their specifications, I was enabled to carefully check scientific accuracy, as best I could, of the experts on both sides. As for instance, in the spot check of Dr. Shapiro's testimony, although a number of his assertions caught my attention as they were almost casually made, I chose one of his statements relating to calculations in physics. He said that the pressure at the top of the bath being 1 atmosphere, the atmospheric pressure of a sixty inch depth of bath was 2 atmospheres. Supporting my own calculations by a well-known Standard Handbook for Mechanical Engineers, I checked [141] and recalculated 1 atmospheric pressure at the surface as against the 2 atmospheres at the sixty inch depth of bath and found that the atmospheric pressure would be calculated as 14.6 divided by **[79]** 14.6 which would equal 1 atmosphere (rounded out) of the sixty inches, and when added to the 1 atmosphere at the surface it showed the 2 atmospheres as testified to by Dr. Shapiro.

Primarily my inquiry and research in the preparation of this report and opinion was a matter of hindsight, because I was enabled to acquire considerable technological education and insight into the scientific features involved not only in the Suess et al. patent, but also the prior art patents. The prior District Court found as best it could from the mass of evidence and exhibits, most of which could not be detailedly and fully examined, no special significance to the technology involved in the subject matter, while I on the other hand was not so hampered.

In any event, from this phase of what the District Court considered "tangible evidence in the record" as derived from Demonstrations Nos. 5, 7 and 9, it did not become apparent to the District Court that these demonstrations were grotesquely incomparable to that prescribed by the Suess process, or even to the McLouth operations OP-1

and OP-2; that these demonstrations allowed for approximately 58 times as much oxygen to enter into the baths as was prescribed by the Suess process; that oxygen **[80]** is not visible; that oxygen does not burn; that Dr. Elliott did not contradict himself by saying that bath depth in Demonstration No. 9 was 35-40 percent at one time and 22 percent at another time; that there was no proof that these tests produced the quality of steel which the Suess et al. process produced; that, in fact, no proof was presented on the actual quality and utility of such steel produced as claimed; that the series of conclusions was based on certain hypotheses in order to arrive at the District Court's findings on "avoidance of material agitation by the oxygen stream", with or without deep penetration, was a fiction; that visible throw-out from the demonstrations as seen by the District Court was chemical in causation and was not referred to in the specification as "agitation"; that the specification never suggested that such throw-out was the result of the physical jet action on the bath; that the evidence of the defendant's expert witnesses was not availed by the District Court for its support of the defendants contention, but that instead the negative conclusions drawn from the plaintiff's witnesses, particularly Dr. Elliott, was availed as the foundation for the finding of "tangible evidence in the record"; and that from all of this I am persuaded that the District Court lacked certain technological perceptions, and as a result misinterpretations were made contrary to scientific truths.

[81] **Prior Art Changes in Linz Tests**

The District Court Opinion discussed two series of tests conducted by the applicants at Linz Austria in 1949, specifically those commencing on June 17th and those commencing on June 25th. It concluded that because the June 25th series of tests produced a better quality of steel as against the poor quality of steel produced in the June 17th tests, it occurred because of (1) the change from a Laval nozzle in

the June 17th series to a normal cylindrical nozzle in the June 25th series, and (2) a change in bath distance from 10 centimeters in the June 17th tests to 15 centimeters in the June 25th series.[141] It held furthermore that the "plaintiffs also admitted on final arguments that the only mechanical changes in method from the teachings and disclosures of Dr. Durrer and Dr. Hellbruegge were the change from a Laval to a normal nozzle and an increase in the nozzle bath distance." [142]

The applicants had decided to take the advice of Dr. Durrer and continue experimenting on the Schwarz patent. On June 3rd, they made their first test, but the nozzle melted from being too close to the molten bath surface. After they had started the second test on the same day, the surround containing the water for cooling the nozzle broke somewhat high above the nozzle and water sprayed on the surface of the bath and [82] they obtained a better quality of steel. This set them to thinking and they considered "a new concept, a new mental approach" that perhaps the deep penetration of the Schwarz process was not a desirable practice. On the third test made on June 9th, the experimenters conceived the idea that greater nozzle to bath distance and lower pressure and flow rates were called for.[143] In the meantime they carried out a number of tests, but they came to the determination of testing two ways, one in accordance with the teaching of Schwarz and the experimentations of Durrer and Helbruegge at Gerlafingen, and a second in accordance with their "new mental approach". On June 17th they started with the Schwarz prior art concept of deep penetration, and commencing on June 25th through the 27th they conducted eleven tests with the changed conditions. These tests demonstrated that satis-

[141] Compendium XV, pages 286-287.

[142] Compendium XV, page 287.

[143] Compendium XV, page 288.

factory results could be obtained, but in none of these was there any claim as yet that steel of a quality equal to the open-hearth was available by this oxygen to surface process.[144] Thirty tests up to then had been performed.[145] Still as of the completion of the thirtieth test, the Linz experimenters gave no indication that they had arrived at a process which was either patenable or [83] available for industrial uses.

What I am concerned with here is that the District Court accepted testimony from the patentees and concluded that the only two changes made in the June 25th tests from the June 17th tests and from the prior Durrer-Helbruegge testing at Gerlafingen, were the changing the Laval nozzle to a normal cylindrical nozzle and an increase in the nozzle bath distance from 10 centimeters to 15 centimeters.[146] By itself this conclusion would seem to be non-critical, but when it became associated with the inventor's "method" and what appeared to be the foundation for the eventual finding that "avoidance of deep penetration was the gist of the invention", upon which the patent was based, it became crucial if it was not indeed technically factual.[147] It is, therefore, important that we understand that the difference between the June 25th tests and the Gerlafingen experimentation, or even that of the prior art of Schwarz and Miles, may have been in the change of nozzle from a Laval type to a normal type, and in the raising of the height of the nozzle from 10 centimeters to 15 centimeters, or in other words a lessening of impact pressure. The [84] extrapolation of these two differences to the patent itself is unfounded as being nowhere related in the evidence of the case at McLouth. Furthermore, from an examination of the patent

[144] Compendium XV, page 289.

[145] Compendium XV, page 289.

[146] Compendium XV, page 291.

[147] Compendium XV, page 295.

itself it will be seen that neither of these two changes are mentioned in the patent. Neither did it take into consideration the fact that other differences existed from the prior art, that the nozzle was inserted at the top center and as the vessel straightened, it became approximately vertical and centrally directed.[148] What the District Court also failed to consider and discuss were that additional 220 tests were carried out and concluded as of November, 1950. It will be seen that by reason of all these tests up to November, 1950 neither of the differences or changes concluded by the District Court to be the gist of the invention in the patent were stated in the patent, or bore any materiality or relevance to the specification prescribed in the patent applications as they were presented to the United States Patent Office.[149]

[85] What is noticeable, however, in reading the patent is that it provides detailedly for a series of instructions on using and making the process, which were not even mentioned or discussed in connection with the June 25th tests. From a reading of the Suess specification and of an understanding that it does produce the results which it promises of procuring a quality of steel equal to that obtained from the open-hearth it is evident that the patent provides the correlated ingredients which comprise the "method" of the subject matter as in effect a combination process.[150]

It would seem then that the District Court did not correlate and differentiate the method of the June 1949 Suess experimentation from the Gerlafingen experimentation as the testimony purported, but rather from the patent specification itself, and so arrived at the conclusion that the only difference of the Suess patent from the prior art was one of "lower impact pressure".[151] Therefore,

[148] Compendium XV, page 290.

[149] Compendium XV, page 290.

[150] Compendium XV, page 295.

[151] Compendium XV, page 302.

while Drs. Hauttmann and Trenkler testified to the two main physical or mechanical differences in early Suess tests at Linz of a change from a Laval nozzle to a regular nozzle and of heightening it, it held no support for the [86] District Court's finding that it was the invention for which the patentees made application in the United States Patent Office and upon which applications a patent was eventually granted. Yet it might also seem possible that, if the District Court misread the stipulation as having movement or circulation induced physically or mechanically by the oxygen jet, that it could be easily convinced by these two changes in the early experimentation at Linz, that such physical changes could support its interpretation of the stipulation to that effect, and its eventual finding that adjustment of the impact pressure of the jet contributed or caused an "avoidance of deep penetration which was the gist of the invention."[152]

[87] **The Plaintiffs' Final Argument**

The District Court said that the "plaintiffs also admitted on final arguments that the only mechanical changes in method from the teachings and disclosures of Dr. Durrer and Dr. Hellbruegge were the change from a Laval to a normal nozzle and an increase in the nozzle bath distance." This may be a highly critical factor which I must consider in the light that it was a potential inducement guiding the District Court into the thinking that reduced impact pressure of the jet upon the bath produced the avoidance of deep penetration, and eventually was the gist of the invention.[153]

The testimony of certain witnesses that the only physical change between the June 17th and June 25th series of tests at Linz was that from a Laval nozzle to a normal nozzle and that of increasing the nozzle bath distance from 10

[152] Compendium XV, page 304.

[153] Compendium XVI, page 306.

centimeters to 15 centimeters occupied considerable time in the plaintiffs' final arguments.[154] At times in this argument the statements of counsel for the plaintiffs would seem to support the District Court's statement that "plaintiffs also admitted on final arguments . . ." [155] However, I cannot stop here because, first, the District Court disregarded more than 200 tests which were conducted after June 27th by the Suess patentees, and second, that what counsel for the plaintiffs was saying or trying to say **[88]** about the patent itself is revealing. We know that the so-called changes from the prior art and the June 25th tests were not incorporated in the Suess applications filed in the United States Patent Office.[156] And because counsel for the plaintiffs, who was trying to be submissively respectful to the District Court, was unable to get in the points which clarify the difference between the prior art and the Gerlafingen experiments with the eventual Suess patent process applications. As for instance, counsel said at one time during the arguments:

> "I want to make myself clear on this matter of the new mental concept. I'm not suggesting, your Honor, that we have here a patent on just a mental concept, because what we have is a process patent. We have in the specification a description of the process, and we have in the claims a statement of the considerations, the guidelines, the steps that have to be carried out in order to accomplish results sought by the inventors." [157]

On another occasion he said:

> "The bath movement should not be caused by the mechanical action of the oxygen jet but by the chemical reactions which take place . . . the desirability of creating a hot spot—that is, a highly reactive zone—in the central portion of the surface of the bath and in the upper region of the bath which is spaced from the refractory lining of the vessel—that is, from the walls and from the bottom." [158]

[154] Compendium XVI, page 306.

[155] Compendium XVI, page 306-308.

[156] Compendium XVI, page 309.

[157] Compendium XVI, page 309.

[89] While counsel did attempt to impress the District Court with the fact that the new concept included the physical necessity of the "lowering of the impact pressure of the jet on the metal bath", he also attempted to explain that this one phase of the concept created the extremely high temperatures in the localized reaction zone and prevented the "burning of the refractories, and at the same time eliminating the phosphorus by blowing contrary to what prior art believed had to be done by blowing deeply into the bath." [159]

At another time when the District Court said it was not enough to say you are going to blow so as to avoid all these things if you don't teach how to do it, counsel replied.

> "That is what the specification is for, and that is just what the specification does." [160]

At another time, he said:

> "No. I think that the claim sets forth the method, your Honor. And I think that how to do it, within the broad considerations, the broad principle specified in the claim, the specifications tells everybody in the arts just what to do." [161]

[90] On still another occasion counsel referred to the examples and the "exemplary commercial practices" set forth in the patent.[162] On still a different occasion he stated that

[158] Compendium XVI, page 310.

[159] Compendium XVI, pages 310-311.

[160] Compendium XVI, page 312.

[161] Compendium XVI, page 312.

[162] Compendium XVI, page 314.

> "the mental conception of the method of operation is the important feature, and that that mental conception, which is *reduced to the process steps* which are set forth in the claims, is the thing which resulted in a new mode of operation which had brought about these important and far-reaching consequences." (Emphasis added)

What is important is that counsel did, at various times, attempt to set out the various features or factors of the Suess patent, which differentiated it from the prior art; such as the avoidance of the stirring action in the bath as practiced in the prior art; [163] the vertical blowing in the Suess patent as against angular blowing in the prior art [164]; the ratio of bath depth to surface area.[165]

[91] It seems to me from an examination of the entire final argument with plaintiffs' counsel, that plaintiffs' counsel was trying to make clear to the District Court the difference of what was conceptual to the Linz experiments in June 1949, and what had become conceptual to them when they filed the application for patents both in Austria and in the United States. The patent application and the continuation-in-part applications show an enormously patentable different between the June, 1949 experiments at Linz and the eventual contents which were incorporated in the patent application.

Counsel made a remark in this connection:

> "You must not forget that this particular art was in an embryonic state at the time that these people wrote some of these things in the early days, because they didn't fully understand the chemistry involved, or at least I don't believe they did. They did an admirable job, however, when it came to filing their applications and pointing out what this real new concept was . . ." [166]

[163] Compendium XVI, page 315.

[164] Compendium XVI, page 315-316.

[165] Compendium XVI, page 316.

[166] Compendium XVI, page 326.

[92] From a reading of the applications, it is readily apparent that they do not contain the words "Laval nozzle" or "heightening the nozzle" from the bath surface of 10 centimeters to 15 centimeters, but yet it would seem even as of January 1951, when the patent application was filed, the scientific theories were not yet understood. As for instance, it is shown by the statement in the specification that "It is believed" that the circulation occurs in a particular way, and yet while it is not required that patentees must know the scientific principle by which their patent works, how is it possible to condemn counsel if he, in fact, has such a deficient knowledge of the scientific functioning of the patent which he is sponsoring for his client? This is true, became I, by hindsight, now realize that counsel for the plaintiffs might have pointed to much in the specification for answers to the District Court's questioning on what the process is and how it is believed to function.[167]

On the basis of the various colloquies I got the impression that the District Court was relying less upon what was contained in the Suess patent and more on what it deduced from the testimony of the various witnesses. So while the specification tells the steelmaker how his process is functioning, it does not tell him **[93]** in *totidem verbis* to avoid deep penetration, since he would be doing that by just following the instructions in the specification. Thus, while the District Court was inspired by the fact at this stage of the case in the final argument that "the aspects of the invention necessarily follow from avoidance of deep penetration", it is obvious from a reading of the entire specification that this was fallacious; because we see that the specification's teachings of limitations of blowing pressure, vertical and central blowing, together with the other instructions, are abundantly and particularly set out and explained. The law does not demand anything more than this.[168]

[167] Compendium XVI, pages 327-329.

[168] Compendium XVI, pages 332-333.

Because the District Court in the plaintiffs' final argument dwelled upon the idea that the change from the prior art of nozzle difference and placement as it avoided deep penetration and was therefore the gist of the invention, I must carefully examine the record to ascertain whether the plaintiffs provoked or caused this thinking as against the plainly stated words of the specification. And yet I have the idea that the District Court was informed on several factors of the Suess process. On one occasion, the District Court said, ". . . I suppose, that all of the other aspects of the invention necessarily follow from the avoidance of deep penetration?" Counsel for the plaintiffs replied, "I don't think it can be simplified to **[94]** that extent, your Honor, because of the possibility that somebody would be able to blow and cause the oxygen jet to cover, we will say, the entire area of the bath. That is not covered by our patent. But I doubt very much that anybody could do that and make good steel." [169]

So, too, when counsel stressed the necessity for an appropriate contact between the oxygen jet and the metal, in order to create the localized reaction zone, it seems to have made no impression upon the District Court, because it eventually ruled that the word "below" and "localized reaction zone space a substantial distance from the refractory lining" could exist even with deep penetration as taught by the Schwarz and Miles patents.[170] Thus the District Court Opinion would seem to indicate that during final argument with plaintiffs' counsel, there was a gap in the thinking as to the chain for technically comprehending and understanding what the Suess process was and the seemingly sidetracking of it to what it was not, i.e., a practically one step physical manipulation of the oxygen jet so as to lessen impact pressure.[171]

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[169] Compendium XVI, page 334.

[170] Compendium XVI, page 335.

[171] Compendium XVI, page 335-336.

So that when counsel for the plaintiffs attempted to **[95]** explain that "avoiding material agitation of the bath by the oxygen stream" also "embraces . . . this matter of avoiding deep penetration . . .", it lent no persuasion to the District Court because it (the claim) "doesn't use that language".[172] Other similar examples appear in the record.

Counsel made efforts for clarification of what the Suess process was intotality yet he was unable to do so. I am earnestly of the belief that the assumed riddle which the District Court evolved from the thinking that the plaintiffs had contended that a 1 unit of physical or mechanical force-power could overcome a 3000-8000 units of chemical force-power and by the erroneous conclusions which it had deduced from the Ann Arbor demonstrations, particularly Nos. 7 and 9,[173] was because the District Court seemed to have relied more on what the expert witnesses said than on what the specification itself said, and yet what it corroborated by the fact that it affirmed its belief in the invention and that it was capable of being accomplished by persons skilled in the art of steelmaking.[174]

[96] Dr. Trenkler and Dr. Hauttmann did say that in their early experimentation in June 1949, there were the two changes of nozzle and of nozzle bath distance. Also, that these were changes from the prior art of Schwarz and Miles, and that these two changes did not become as such features in the application for patent rights by Suess. We are informed that there were approximately 250 tests required for ascertaining the circumstances necessary for such a working process, and that although the experimenters got good steel with the June 25th series of tests, there is no

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[172] Compendium XVI, page 336.

[173] Compendium XVI, page 338-339.

[174] Compendium XVI, page 339.

evidence in the record that either experimentation process of June 25th, 1949, or quality of steel which it produced were either the process of the patent application or of the character of steel which was eventually desired to be achieved and was achieved, that is, steel of open-hearth quality.

My inquiry shows that counsel for the plaintiffs did feature avoidance of deep penetration as the "new concept" and as differing from Schwarz and Miles, as well as from Durrer and Hellbruegge. It also shows that plaintiffs' counsel while featuring the avoidance of deep penetration put on a "selling campaign to the District Court of 'reduced impact pressure of the jet on the bath so as to avoid deep penetration" and that he [97] in very great likelihood oversold the feature at the trial. However, the inquiry shows that the plaintiffs' counsel did not advocate "avoidance of deep penetration" or reduced impact pressure" as the exclusive feature of the Suess process, although he spoke less of these. My inquiry shows that he did attempt to advocate "deep penetration" and "heavy impact pressure of the oxygen jet" as prior art devices required for stirring the bath. However, it may not be said that plaintiffs' counsel did not attempt to advocate vertical blowing as against angular blowing of the prior art, central surface blowing as against the non-specified blowing of the prior art, of ratio of bath depth to surface area requirements, of prescribed limits within which pressure was to be applied, and of prescribed height distances within the limits as set forth in the specification, all for the purpose of procuring a "localized reaction zone" at the center surface of the bath to bring about chemical circulation as against mechanical jet circulation. All these and more were the instructions contained in the specification. None of these found meaning, since no finding supported their existence in the District Court Opinion.

[98] So it is that while the Opinion credits Dr. Trenkler, Dr. Hauttmann, and plaintiffs' admissions on final arguments, to the effect that there were only two changes, that from a Laval to a normal nozzle and an increase in nozzle bath distance from the prior art, such findings have no connection, in so many words, with or effect upon the patent's specification. The District Court Opinion attempts to make that connection by finding that the original changes in June 1949 from Dr. Durrer and Dr. Hellbruegge of a nozzle and of a nozzle bath distance were the changes which provided "a reduced impact pressure of the jet on the bath so as to avoid deep penetration"; that "such avoidance of deep penetration" " 'was the new concept, the new mental approach' of the patentees",[175] and that such maximum limit on penetration appears to this Court to be the real gist of the invention by the patentees . . ." [176]

Thus, it would seem that the admissions of Dr. Trenkler and Dr. Hauttmann, as well as of the plaintiffs, including the advocacy of plaintiffs' counsel, were not in reality the moving cause for the District Court Opinion's finding that the new invention existed only because of the lowering of the impact pressure.[177]

[99] **Oxygen**

The District Court asserted that it was "unable to fix with certainty any date on which oxygen became available inexpensively in large quantities for commercial production of steel." The Court of Appeals accepted this statement of the District Court and assumed "that the lack of commercial quantities of oxygen would affect the quality of the disclosures in the prior art on matters such as specific commercial operating conditions, demonstrative examples and the like . . . The commercial unavailability of oxygen would explain the absence of any prior attempts to apply the

[175] Compendium XVI, page 348.

[176] Compendium XVI, page 348.

[177] Compendium XVI, pages 346-349.

Schwarz and Miles patents and would thus weaken any inferences that such a lapse in the industry might raise on the issue of obviousness.'' [178]

The District Court had before it a number of defendant's witnesses who made various statements. Drs. Durrer and Hellbruegge had been working on oxygen smelting on an industrial scale before January, 1941. Dr. Hellbruegge stated that in the late 1930's adequate quantities of oxygen were available for experimental work, and as of such time commercial quantities of oxygen were not required.[179] Dr. Hellbruegge stated that large quantities of oxygen were available in 1940.[180] In 1928, **[100]** Dr. Fraenkl discovered a process of extracting oxygen from the air on a tonnage quantity basis. The discovery became known as the Linde-Fraenkl process. Dr. Durrer said that this process made it cheaper and available for them in the metallurgical processes.[181] Another defendant witness, Lyle J. Johnson, Vice-President of Engineering of McLouth, said that as of 1940 there were a number of tonnage oxygen plants which had been constructed suitable for this type of use.

With this evidence before it, the District Court could have made a finding that there was or was not oxygen available for industrial use on and after July 3, 1943, when the Schwarz patent was published. Recognizing that the Second World War ended on September 2, 1945, and that the free world might not have had access to such Schwarz patent until after the war, it was nevertheless evident that any bare ''conflicting evidence'' arose between the defendant's own witnesses not from anything which the defendant's wit-

[178] Compendium XVII, page 352.

[179] Compendium XVII, page 352.

[180] Compendium XVII, page 353.

[181] Compendium XVII, page 353.

nesses contradicted in the plaintiffs' testimony. Under these circumstances, the defendant upon whom the burden **[101]** rested, did not present legal evidence that oxygen was unavailable for industrial use and purposes after the Schwarz patent issued.[182] Since this bears on the matter of unobviousness and utility, even though in a secondary sense, of the Suess patent as contrasted with the prior art, and since it involves a scientific factor on the question of novelty and invention as such, I deem it appropriate to inquire into this matter.

The Schwarz patent was allowed as of May 24, 1939 and made known on April 3, 1943. The Miles patent application was filed in the Kingdom of Belgium on October 4, 1946 and granted on November 30, 1946.[183] I considered that if the German patent was anywhere near as good as Dr. Schwarz said it was that the Government of Germany (and Schwarz was an employee of its steelmills) would have made as much use of it as its potentialities would have allowed for the war efforts. There is no evidence of such use.[184] Allowing for the fact that there was a letdown for steel after the war, there had been no letdown in steel production during the War in the United States. And common **[102]** knowledge has it that this country outreached itself in steel productions as spurred on by the war, even as they concentrated upon the construction and utilization of the atomic bomb by availing all scientific minds and energy from all parts of the world for its production. While this is not altogether a substantial comparison, the speedy procurement of steel from iron by the use of pure oxygen was well known from published reports emanating in this country, primarily from official United States sources and the American Iron and Steel Institute, as well as published reports in Europe, as I shall presently describe.

[182] Compendium XVII, page 355.

[183] Compendium XVII, page 355.

[184] Compendium XVII, page 356.

If the theory was as utilizable as Schwarz contended in his patent as early as 1939—and even earlier from his experimenting with it—the method for obtaining pure oxygen had already been presented to these scientists as early as 1928. There is no evidence in the record that the means for procuring pure oxygen dependent upon anything more than building a plant to produce it from the air. From the record it is apparent that a number of plants were already in production of pure oxygen and **[103]** that these plants were dispensing it in bottles and transporting it to the users. The question arises, if the Schwarz patent was as good as it claimed, why would not the H. A. Brassert & Co. of Berlin, Charlottenburg, by whom Schwarz was employed, have erected the necessary oxygen plant in the place of the manufacture of steel. That the Company did not do so raises the presumption that the Schwarz patent was not within the competence to produce as it claimed.[185]

Up to the time of the Suess patent, it would seem that oxygen had its use only in the laboratory, and thus procuring it in transported bottles from the oxygen plant, was the convenient and economical way to do. I am reminded of the early use of oil in the United States, when its prime purpose was for furnishing kerosene to light lamps, grease to lubricate wagon wheel axles, and other similar chores. So it seems in the early days after 1928, the first use of oxygen tonnage was really not for using the oxygen, but rather for separating the air for its nitrogen to be used as fertilizer, while the purified oxygen found practically no users at all. That is not to say that there was no experimentation going on both in Europe and in the United States.

[104] The fact that experimentation had been going on both in Europe and in the United States is set forth in published reports. As I stated previously, at my request the parties presented me liberally with an abundance of publi-

[185] Compendium XVII, pages 356-357.

cations. Some of these are recorded as exhibits in the McLouth record. In the American Iron and Steel Institute (AISI) Yearbook, 1920, we learn that Carl Linde of Munich and Georges Claude of Paris had innovated the commercial development by which air was separated into nitrogen and oxygen by liquefaction and distillation; that its cost was from $25.00 to $30.00 per ton; that the knowledge of its use was very narrow, primarily in the fields for cutting and welding, and that for these purposes bottle oxygen was sufficient. In the same publication, it was stated that the cost of oxygen depends directly on the use to be made of it. If there is no use for the oxygen, the matter of cost is without interest. But it did promise that the availability at an extremely low cost is now in sight and gives large promise of economy in steelmaking.

In 1923, a published report by the Department of the Interior, Bureau of Mines, said that ". . . the comparatively small demand for the product [oxygen] has prevented the installation of large units suitable for metallurgical processes . . ." It **[105]** stated that "large oxygen manufacturing plants can be built to serve metallurgical purposes directly, which, by virtue of their large production and correspondingly increased sufficiency, together with the fact that no compression in cylinders, storage, transportation, or service will be required will be capable of delivering oxygen for the processes at a cost not to exceed $3 per gross ton. In other words, the Committee finds that the oxygen industry is now able to make plants for supplying large quantities of oxygen to metallurgical industries at low cost." We remember that this was five years before the Fraenkl process came into existence in 1928.

During the years commencing in the late 1920's or early 1930's as the McLouth record discloses, a long list of named steelmen and more unnamed steelmen were active generally in the field of application of oxygen to metallurgy.[186]

[186] Compendium XVII, page 360.

[106] In June, 1924 a report published by permission of the Director, United States Bureau of Mines, repeated that large manufacturing plants can be built to serve metallurgical purposes at a cost not to exceed $3 per gross ton.[187] Russia attempted blowing enriched air and pure oxygen into a Bessemer converter in 1945, but procured a poor quality of metal and the wearing out of parts "in view of strong overheating of the bath".[188]

In 1948, J. H. Zimmerman, Manager Development Division of the Linde Air Products Company, in the Iron and Steel Engineers Yearbook, indicated that over 6,000 heats using oxygen in some 34 furnace shops in which the majority had availed high purity 99.5% oxygen, were "supplied from existing liquid oxygen systems because of its availability in substantially large volumes and ability to serve high demand rates."[189]

A. G. Robiette, a Director of John Miles & Partners (London) reported on the results of experiments, started during the late war years, about 1945, when an electric furnace used about 90% oxygen. He also reported that two production size plants were **[107]** going up in Sweden for the use of this process, as well as one in France and one in England. He did not report on the unwanted elements contained in the finished product or of the condition of the refractories in their "actual pilot scale experiments".[190]

In 1948, Dr. W. M. Pollitzer, Technical Industrial Intelligence Division, Department of Commerce, told of the building of a blast furnace for experiments with oxygen enriched air in 1933. The experiment used more than 26% enriched oxygen air and was found to be unsuccessful. Dr. Pollitzer

[187] Compendium XVII, page 359-360.

[188] Compendium XVII, page 361.

[189] Compendium XVII, page 361-362.

[190] Compendium XVII, page 362, 370.

also told of the building of a plant at Trostberg in Eastern Bavaria for the purpose of utilizing "cheap oxygen", because the Linde plant was manufacturing nitrogen as fertilizer and leaving the oxygen as a by-product for which there was little use.[191]

During World War II, the United States produced in conjunction with the National Defense Research Council "together with the technical talent of this country" portable and stationary oxygen plants for use in the Pacific on shipboard and at other battlefronts. After discussing its use for the production of iron and steel and the cost he arrived at the figure of $3 per ton of oxygen.[192]

[108] In approximately 1946, the Weirton Steel Company installed several small pure oxygen plants for the production of 99.5% oxygen for general steel plant use.[193] Since the year 1945 the international demand for steel had been expanding and with it the use of oxygen, accordingly metallurgy, had also become more a matter of interest. The developing steelmarket stimulated the introduction of technics designed to increase production.

And yet Schwarz in a paper published in 1949 introduced into the McLouth record, ten years after he had filed for the German patent and six years after it was published, discussed the use of oxygen blowing in a Siemans-Martin and Electric furnace, as well as to blast furnaces. In any event, I noted particularly that he did not discuss the Schwarz patent as it might have been experimented upon or utilized in the metallurgical industry during the years under discussion.[194] He also discussed the oxygen installa-

[191] Compendium XVII, page 363.

[192] Compendium XVII, page 364.

[193] Compendium XVII, page 364.

[194] Compendium XVII, page 366.

tions at the Weirton Steel Company and the make-up of costs and amortization as being $8.82 per ton.[195]

In 1952 Dr. Schwarz presented another report which was introduced into the record as another exhibit. As I observed from what Schwarz reported in the two papers, he never claimed that [109] "good steel" was produced by "blowing of basic Bessemer pig iron with a free jet lance".

In close relation to the Schwarz report, I examined a second report by A. G. Robiette presented before the Norwegian Metallurgical Society on April 26, 1948 in Oslo. He talked about various applications of oxygen which was made possible by the developments of cheap oxygen by Linde-Fraenkel and other systems. He said that these had "so reduced the cost of oxygen that it can now be seriously considered both for combustion systems and for the refining of pig iron and the production of steel." It is noticed that he made no enthusiastic discussion about the Miles patent.[196]

In the reports both of Schwarz and Robiette I particularly noticed that there were no complaints as to oxygen unavailability for industrial application.[197] Thus from the exhibits produced in the McLouth record and these historically published reports, oxygen was available not only for experimentation but as well for manufacturing purposes—if any process of direct oxygen application to blast furnace or pig iron, particularly that of Schwarz and Miles, had a workable process. It is noticeable, too, that no steelmen rushed to either the doors of Schwarz or Miles and adopted [110] their processes. This is some evidence that the processes of both Schwarz and Miles were not workable and productive as claimed. So that from the

[195] Compendium XVII, page 367.

[196] Compendium XVII, at page 369.

[197] Compendium XVII, at page 370.

early 1940's, it was possible to build a plant for the industrial application of oxygen and no unusual occurrences took place until 1951-1952, when the Linz plant was established for tonnage oxygen to be used directly in iron to steel conversion.

When Carl Linde and Georges Claude had prior to 1920 conceived the idea of extracting oxygen from the air, and making it available in bottles for storage and transportation, it was not until 1928 that Fraenkl introduced the method of making tonnage oxygen available on a large scale. At that time in Germany, the Linde-Fraenkl plant was established and in other places including the United States, a large number of plants produced oxygen and made oxygen available for scarfing and oxyacetylene uses. The early thought was in attempting to enrich the air which was introduced into blast and Bessemer furnaces for speeding up the steel process. However, too many disadvantages arose which made it impractical. After the Linde-Fraenkl process was divulged, the United States Government procured portable oxygen-making plants [111] which it used during the Second World War. In West Virginia, the Weirton Steel Company had established a plant in 1946. In Germany, Dr. Carl Schwarz of H. A. Brassert & Co. was issued a patent on surface application of oxygen to molten metal but as late as 1949, it is obvious that Dr. Schwarz had not yet arrived at a practical method of industrial steelmaking. In 1943 and 1946, John Miles of the John Miles & Partners (London) Limited, a steelmaking company in Great Britain also was issued a patent, but it is apparent from a director of that company, one Robiette, that the Miles process was still in its experimental stages. In any event, it is apparent that "relatively cheap oxygen was available as early as 1930, either as evaporated liquid or from tonnage plants". It was also true that oxygen plants were being constructed and could be constructed at the sites of steel mills for cheap tonnage oxygen. However, while nitrogen was being recovered for use as fertilizer by this method, no substantial use

for the cheap oxygen by-product had been as yet discovered. While the later war years and post-war years found a lag in the steelmarket demand, experimentation continued on oxygen utilization in the steel industry. Both Schwarz and Miles, connected **[112]** as they were with steel manufacturers, also continued experimentation, but neither were instrumental in bringing about an oxygen steelmaking plant in accordance with their patented processes. Neither, in published papers, claimed anything more than experimentations; and neither claimed that they had insufficient available oxygen for making their process workable. So that while in the early 1940's it was possible to build a plant for the industrial application of oxygen, yet no unusual occurrence had taken place up until 1951-1952, when the Linz plant was established for tonnage oxygen to be used directly in iron to steel conversion.

From the viewpoint, then, that the cost of installing the oxygen mill with the use of a vessel capable of being inclined on a trunion, and for the economical recovery of high quality steel from iron in a matter of 20-30 minutes as against eleven hours under the open-hearth method, the cost of the oxygen which prevailed during the 1940's would have proved no hindrance to any who wished to follow the Schwarz or Miles patents. In any event the McLouth record is devoid of legal proof bearing upon prior art obviousness and utility in derogation of the Suess et al. patent.

[113] **The Court of Appeals**

The Court of Appeals accepted a great deal of the conclusions made by the District Court, but the most critical of these was that "avoidance of deep penetration was the [subject matter and] gist of the invention." I firmly believe that if the finding had not been made by the District Court that "avoidance of deep penetration is the gist of the invention," the Court of Appeals would not have been misdirected as to the scientific facts.

In examining the Opinion of the Court of Appeals it will be seen that no place does it mention why it accepted this finding of the District Court and barely mentions the mechanical or physical aspect which the District Court found to be an invention—that is, the "reduction of impact pressure" as the Suess inventive discovery.[198]

Although the Court of Appeals affirmed the ultimate determination of the District Court on the grounds that the patent overclaimed the invention and covers prior art, and that while it said that it was "unnecessary to consider the correctness of every ruling of the District Court," it nevertheless did comment on a considerable number of the District Court's findings.

[114] It correlated avoidance of deep penetration as "the direct antithesis of the thinking then prevalent in the steelmaking art" and concluded that this raised "other problems of defining exactly what novel element the patentees claim and how that novel element might be meaningfully distinguished from the prior art."

The Appeals Court asserted that "avoidance of deep penetration" was an abstract phrase and could "gain meaning only from the limitations placed upon it by the patent and from the knowledge that may be attributed to an ordinary worker skilled in the art."[199] It then made a series of conclusions, holdings and findings.[200]

1. As for the holding by the Court of Appeals that the District Court's conclusion of non-obviousness was based entirely upon secondary considerations of long-felt but unsolved needs, I refer to what I said in Compendium VXII, page 360 and Compendium XVIII, page 383, that thirty named and a number of other unnamed experimenters were

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[198] Opinion Compendium XVIII, at page 374.

[199] Compendium XVIII, at page 376.

[200] Compendium XVIII, at pages 378-385.

at work with oxygen in steel plants. Whether these indicated the long-felt needs may be questionable; **[115]** that its was an unsolved need is unquestionable, particularly as was testified to by the defendant's witness, Dr. Durrer, and the plaintiffs' witness, Dr. Hauttmann, without contradiction that not only Gerlafingen test results, but also Schwarz and Miles, produced no commercial quality products. However, this testimony was for secondary consideration, but as secondary consideration, it would be admissible as evidence under *Graham* v. *John Deere Company, supra,* where non-obviousness becomes an issue of fact.

2. As for the holding by the Court of Appeals that it did not have the benefit of a complete determination of the difference between the prior art and the patent in suit, or any findings concerning the level of skill in the pertinent art, there is first of all admittedly no evidence in the McLouth record that steel with satisfactory content was made commercially by anyone in the 1940's using the oxygen blowing process, despite the extensive experimentation which was carried on by these oxygen-steel experts.[201] Also, the District Court made these distinctions: (1) prior art produced objectionably high phosphorus content in the steel and caused refractory damage;[202] (2) the prior art **[116]** teachings of Schwarz did not teach "the avoidance of material agitation of the bath by the oxygen stream or a circulation of the bath produced by chemical reactions in the localized reaction zone as claimed by the patent in suit"[203]; (3) the District Court recites the differences in the Miles patent and the patent in suit[204]; (4) the District Court Opinion differentiates with considerable detail and charts the prior art products at Gerlafingen which practiced the

[201] Compendium XVIII, at page 384.

[202] Compendium XVIII, at page 384.

[203] Compendium XVIII, pages 385-386.

[204] Compendium XVIII, page 386.

prior art of Schwarz, did not produce high quality of steel and did not preserve the refractory life in the vessel as against the chemical content at Linz, particularly in the June 25th tests[205]; (5) the Schwarz patent, unlike the patent in suit, does not teach specific operating conditions.[206] As against the prior art patent, the Suess patent provided instructions which could be followed by persons skilled in the art to make satisfactory steel and could be extrapolated for various operating conditions for larger heat sizes.[207]

[117] 3. The Court of Appeals found that the District Court found three considerations dispositive on the issue of obviousness: (1) presumption of validity; (2) the commercial success of the basic oxygen process; and (3) secondary considerations concerning prior attempts and failures of oxygen steel refining. As for the presumption of validity which the statute gives to a patent when it is issued by a patent office, although it is not conclusive, yet it does according to the Supreme Court give the grant of a patent substance and value. Thus, the very issuance of letters patent is prima facie evidence of validity.[208]

Although the Court of Appeals recognized and accepted the District Court's inability to determine when commercial quantities of pure oxygen became economically available and stated that it "would explain the absence of any prior attempts to apply the Schwarz and Miles patents . . . and thus would weaken any inferences as such a lapse in the industry might raise on the issue of obviousness," there is abundant evidence in the record from McLouth's own witnesses, Lyle Johnson, Vice-President in charge of Engineering, Dr. Durrer and even the prior patentee, Dr. Schwarz, that oxygen was available and that no efforts were

[205] Compendium XVIII, page 386.

[206] Compendium XVIII, page 386.

[207] Compendium XVIII, page 387.

[208] Compendium XVIII, at page 390.

[118] made to industrialize the Schwarz process application of iron to steel during the years 1940 through 1952. Furthermore, none of the experimenters, including Dr. Schwarz, Dr. Durrer, Dr. Hellbruegge and others ever complained that oxygen was unavailable on a tonnage basis, by the construction of a plant, at the site where it was to be used for refining of iron.[209]

4. As for the finding by the Court of Appeals that the failure of the Patent Office to cite the Schwarz patent significantly weakened the presumption of validity,[210] it is noticeable that the Court of Appeals admitted hat there was "mention of the Schwarz patent in the file wrapper as contained in the affidavits of Rinesch and Hauttmann" but it gave no weight to these affidavits because they were filed late and "submitted to the Patent Office and filed somewhere obscurely in the file wrapper history of the patent."[211]

[119] In spite of the fact that Patent Office rules require that "no attention will be paid to any alleged oral promise, stipulation or understanding in relation to which there is disagreement or doubt," [212] the filing of the Hauttmann and Rinesch affidavits by the Suess applicants made them a part of the file wrapper history and as such, as much a part of the file wrapper history as any other paper. Furthermore, the rule of the Patent Office grants applicants the right to interviews.[213]

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[209] Compendium XVIII, P. 393; See Compendium Oxygen XVII, 360 page ——, where the record shows that at least 30 individuals were engaged in experimenting to find a "remedy or a resolution" of their problems of applying oxygen directly to molten iron and producing an industry acceptable steel, while at the same time avoidance the destruction of the refractories.

[210] Compendium XVIII, pages 394-395.

[211] Compendium XVIII, page 395.

[212] 37 C.F.R. 1.a.

[213] 37 C.F.R. 1.133.

[120] And yet the file wrapper history in this case is not devoid of a recording of the discussion with the examiner on May 1, 1957. This reads as follows:

> "Claims of the application are cancelled and new claim 17 and 18 are substituted therefor, in view of the discussion with the Examiner on May 1, 1957.
>
> The new claims are presented in view of information recently made available and which indicate that the instant application discloses a fundamentally different approach to the refining of pig iron or crude iron by means of substantially pure oxygen and was suggested heretofore. The new claims are believed to be properly definitive of the invention." (PX2A, at page 74)

Similarly there is a recording in the file wrapper history with a reference to Schwarz.[214] That is was considered by the Patent Office is verified by an explanation requested of the applicants of the obviously high phosphorus value and for which a cablegram was received as was stated in the file wrapper history.[215] In the Hauttmann affidavit as filed, both the Schwarz and Miles patents were mentioned in two places.[216] Thus it would seem that the file wrapper is not "void" as to the content of the discussion with the Examiner on May 1, 1957.[217]

[121] In this respect I am of the opinion that the Court of Appeals was misguided by the original findings of the District Court that "reduction of impact pressure" was the "avoidance of deep penetration [which] was the gist of the invention." Thus, if the McLouth District Court did misinterpret the specification and arrived at the conclusion that the specification stated that the oxygen jet physically or mechanically produced circulation in the molten bath, and

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[214] Compendium XVIII, page 398.

[215] Compendium XVIII, page 399.

[216] Compendium XVIII, page 401.

[217] Compendium XVIII, page 403.

thereafter made its determination that the adjustment of the oxygen jet was the invention by the avoidance of the deep penetration of the bath—and as such was the gist of the invention—is accepted and followed by the Court of Appeals rather than as viewing this as the intermediate result of the instructions contained in the Suess specification and a caution to the operator, then the original misinterpretation of the District Court would have become threaded into the thinking of the Court of Appeals and the technological comprehension of what was stated in the specification would inequitably result.

There is further proof before me in the record in the first post-trial hearing from Claude A. LeRoy, the Primary Examiner, that the language contained in the affidavits was considered and acted upon by the Patent Office.[218]

[122] 5. As relates to the holding by the Court of Appeals that the Schwarz patent does not teach agitation of the bath by the oxygen stream, I refer to the Schwarz direction for introducing the jet of gas "with such a high kinetic energy that it is capable of penetrating in the manner of a solid body deep into the bath . . ." Thus, while Schwarz does not say in so many words that the jet is to circulate the bath, it could not be presumed that a solid body into the bath would do anything but disturb the bath as a huge spoon would agitate or stir it.[219]

[123] 6. The Court of Appeals found that there could be no competitive action on industrial functioning on the Schwarz patent because VOEST had tied up all of the steel companies into an association known as BOT. As of the time of the agreements, the record indicates that all of the companies, both in Europe and in the United States were experimenting with oxygen application to iron processing, but that none of them had perfected a use for processing

[218] Compendium XVIII, at page 405.

[219] Compendium XVIII, page 407.

by surface blowing on an industrial scale or level. A series of letters and agreements was made a matter of record in McLouth and that four companies Rollsche Eisenwerke, Gerlafingen, Mannesmannwerke Huckingen, Vereinigte Osterreichische Eisen-und Stahlwerke AG, Linz, and Osterreichische-Alpine Montangesellschaft, Vienna, agreed to exchange experience in the field of metallurgical use of oxygen in iron and steel plants, such as coke blast furnaces, electric blast furnaces, in melting processes involving converters, open-hearth furnaces and electric furnaces as well as in other metallurgical processes.[220] **[124]** However, there was no agreement on more than a mutual sharing of each others acquired information in their experimentations with oxygen, but there was no agreement on any competitive or monopolistic exclusion of the other steelmakers. However, it will be noticed that these agreements did not prevent anyone of them from building and utilizing Schwarz and Miles patents, if in fact Schwarz and Miles had had a successful and utilizable process of oxygen for steel conversion application. The very fact that they did not do so, and the very fact that they were still experimenting as late as 1952, is some evidence of the fact that neither Schwarz nor Miles had a utilizable industrial instrumentality in their processes. And yet even though the factual considerations are secondary, they must be read in their factual settings as they may or may not aid a just and equitable determination of the questions before me.

7. As relates to the finding by the Court of Appeals that the record does not disclose any extensive attempts and failures to refine steel by deep blowing of oxygen between 1946 and 1949,[221] the McLouth record when closely examined reveals an abundance of **[125]** attempts (and failures) as was disclosed and discussed in a part of this

[220] Compendium XVIII, page 408.

[221] Compendium XVIII, page 413.

Opinion Compendium XVII dealing with the oxygen availability.

8. As relates to the holding by the Court of Appeals on the related topic on whether or not the success of the Suess process may be attributable to the disclosures in the Suess patent is unclear because of the arrangement between the four steelmakers of exchanging know-how and engineering knowledge, in addition to what I have set forth here under 6, I should state that the record discloses that there was considerable jealousy not only among the competiting steel companies, but even among the participants at Linz. I had indicated elsewhere that Dr. Durrer was not beneath showing his jealousy of the Suess accomplishment even though he praised it, and as against Schwarz' patenting with whom he said he collaborated and that the Schwarz patent was his idea in 1937. I also indicated that Dr. Durrer, the defendant's witness, presented testimony which was more favorable to the plaintiffs in the McLouth case than it was to the defendant.[222]

[126] 9. Assuming nevertheless that success of the Suess patent was unclear such as to those who purchased its know-how, the purchasers would, nevertheless, have had available to them the Schwarz and Miles patents. Yet nowhere in the record is there any showing of a rush by steelmakers to adopt the Schwarz and Miles process. While on the other hand the McLouth record is clear that an unmistakable rush of skeptical steelmakers came, saw and were convinced. These are circumstances which may be secondary evidence. Yet that the success of the process was attributable to the clear disclosure is obvious. The District Court's finding in this respect is substantially based. There is nothing in the record that shows that the success of the Suess process was incumbered by any understandings arrived at by the consortium of four steelmakers. Furthermore, I discussed the report of Dr. Schwarz in 1949 and 1952, where he referred to the establishment at Linz of an oxygen steelmaking plant, and of the fact that in these reports Schwarz, himself, showed no real enthusiastic conviction for his own patent.[223]

[222] Compendium XVIII, page 414.

10. The Court of Appeals was not impressed by the District Court's conclusion on inoperableness of the prior arts of Schwarz and Miles on the issue of obviousness because of the District [127] Court's assumption that "maintenance of a fluid slag was inconsistent with deep penetration as taught by Schwarz and Miles," and so the District Court interrelated this with phosphorus removal, fluid slag and depth of penetration as related to the "issue [of] . . . obviousness."

There is an abundance of evidence in the record that the injection of the oxygen within the bath produced the iron oxides within the bath and the high temperatures with it; that this lacked contiguity with the slag, which because of insufficiency of iron oxides in its contents, could not react upon sulfur and phosphorus. Efforts by Schwarz and Miles to produce iron oxides and preserve them within the bath, rather than to lose the iron to the slag, prevented sufficient iron oxides to move into the slag for reaction with sulfur and phosphorus. Thus the steel produced by these prior processes was of poor quality because of such unoxidized impurities. Additionally, the prior art process did not save the refractories and so both of these were a problem of the prior art and their experimenters until the Suess process solved it. The Suess solution, then, was nonobvious to the prior art.

[128] Under the scientific facts as abundantly produced in evidence it cannot be said that the District Court "assumed," rather the record discloses the technological chemical phenomena involved in these various processes to have

[223] Compendium XVIII, page 416.

been abundantly supported for a finding that phosphorus removal, fluid slag and depth of penetration are interrelated and that this had not been obvious to the prior art and the experimenters all of whom practiced and preached deep penetration of oxygen into the bath.

11. The Court of Appeals concluded that the patentees had the benefit of almost six years' experience in using the basic oxygen process "plus whatever information they might have obtained through the BOT arrangement" between the filing of the original application and the continuation-in-part application in 1955. As for the information received from BOT, as I have already discussed this here, the patentees received no benefits whatsoever except the advice of Dr. Durrer who believed in the oxygen process and encouraged them to pursue the experimentation in that direction.[224] Furthermore, an examination of the original application as filed in the United States Patent Office in 1951 and the continuation-in-part application filed in 1955, it will be seen that both of these are **[129]** practically identical. Also, an analysis of all the claims filed indicate that what information was revealed from the first through the eighteenth was such information as the applicants had already had as the 250th test in 1950. Since the continuation-in-part application describes the same invention as did the original application, it is legally sufficient.[225]

12. The Court of Appeals held that even though the Miles patent contained no specific teaching of "deep penetration," yet the District Court "implied such a teaching from the recommendation that the gas should be jetted at a supersonic speed." Semantically speaking, this may be correct, since the specific word "deep" was not contained in the Miles patent.

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[224] Compendium XVIII, page 418.

[225] Compendium XVIII, page 419.

In the McLouth record both sides used the words "deep penetration" in the sense that that expression was antithetical to Suess. Thus, deep penetration became a label of the prior art of Schwarz, Miles and the Gerlafingen experimenters. So that when the District Court made its findings that the gist of the prior art invention was deep penetration, and that the gist of the Suess invention was avoidance of deep penetration, it expressed the antithesis of what was prior art and what was the Suess art.

The Primary Examiner expressed it in the same way:

> "The deep language, the deep penetration, I thought, was well known in the art . . . It was well understood in the art that deep penetration meant a considerable distance **[130]** into the bath . . ." [226]

Semantically speaking, the word "deep" is a relative term and is extended by comparative and superlative of deeper and deepest. That the word "deep" does not mean to the bottom or to the utmost depth of a container or space in the cases before us it has a specific meaning which is applicable to the contrasting relationship of the prior art and the later non-deep Suess art.[227] Based upon these facts and definitions we understand that Miles indicated that it was not easy to inject oxygen "within the bath" because a large amount of it was lost in the process of attempting to inject it into the bath. Therefore, he suggested that the oxidizer be in the form of a liquid so as to give a greater force of penetration into the metal, and that this would serve to "circulate and agitate the metal and the slag." Schwarz suggested that the jet be introduced into the bath "in the manner of a solid body." [228]

I am reminded of the more homely uses for using the teaspoon in a cup of coffee, or the mixmaster for cake bat-

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[226] Compendium XVIII, page 421.

[227] Compendium XVIII, page 421.

[228] Compendium XVIII, page 423.

ters or the ice cream maker in "circulating and agitating" the mix and that the blades of the mixmaster and ice cream maker must be deeply **[131]** enough inserted to produce the circulating, agitating or stirring action.[229]

So it is that the deep penetration of the prior art saved the iron at the expense of retaining phosphorus and sulfur in the metal.[230] Whereas with the combination of instructions provided by the Suess specification and the creating of an indent or localized reaction zone at the top central surface of the bath upon impingement of oxygen with the metal, chemical oxidation or reaction occurs at the place of impingement, and so as this specification explains "produces a sufficiently high reaction velocity of the oxygen with the bath constituents to insure the development of autogenous heat . . . consistent with controlled temperature and control and development of other necessary and required process conditions, such as fluid slag, avoidance of over-oxidation (undue loss of iron to the slag), and avoidance of slopping . . . The process conducted under these conditions avoids a deep penetration of the oxygen gas into the molten bath which seriously impairs refractory life at the bottom of the refining vessel." [231]

[132] This last explanation is in actuality a part of the endothermic action in the rest of the bath outside of the localized reaction zone to surface center where the exothermic occurs as this is then described by the Suess patent specification.[232] This I conclude actually contains the much overlooked key to the successful results of the Suess process.

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[229] Compendium XVIII, page 423.

[230] Compendium XVIII, pages 423-424.

[231] Compendium XVIII, pages 424-425.

[232] Compendium XVIII, page 425; Exhibit PX1, col. 4, lines 43-75, col. 5, lines 1-5.

In seeking a gauge by which the term "deep penetration" was taught by Schwarz and Miles, and of believing that the District Court had made a finding in this connection as it related to the Suess application, the Appeals Court suggested that "Even if 'avoidance of deep penetration' could be given a broader meaning than a "practically negligible penetration,' " the file wrapper estoppel would prevent it from being so read and for this reason "the patent must be held invalid." [233]

Since I have already detailedly discussed the file wrapper estoppel question, it is apparent that the Appeals Court could only be guided by the *sua sponte* thinking of the District Court and of the record which it had in that connection. Much of what was stated by the District Court was re-stated and in effect approved by the Court of Appeals. I stated elsewhere that the **[133]** term "avoidance of deep penetration" was never discussed before the Primary Examiner as a "conflicting element," and if the evidence of the Primary Examiner had been before the District Court it is quite likely that the Appeals Court would not have declared that the record was "void" as to the content of the discussion with the Examiner on May 1, 1957. It is obvious then that the real importance of the wording before the Primary Examiner, even as it was noted in the file wrapper history, was not one of similarity to prior art but of the differentiation between the Suess et al. patent and the prior art. As well, instructions for placing the oxygen jet at the surface center of the bath was not a matter of limitation of patent claims, but rather a clarification of wording and the adoption of appropriate words as reflected in "blowing with oxygen, which comprises discharging a stream of oxygen vertically downwardly through the slag layer onto and below the surface of the bath at the central portion thereof, to an extent to avoid material agitation of the bath by the oxygen stream, the contact of the oxygen with the bath

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[233] Compendium XVIII, page 427.

resulting in reaction of the oxygen with a portion of the iron and with the oxidizable impurities of the bath in a localized reaction zone . . .'' [234]

[134] Except for the fact that the claims throughout this patent proceeding in the United States Patent Office made the distinction in the deep penetration of the prior art and the avoidance of deep penetration in the Suess et al. patent application, as they were required to set forth the differentiation by law, none of the claims particularly pointed out and distinctly claimed ''avoidance of deep penetration'' as the ''subject matter which the applicants regard as [their] invention.'' And, further, the applicants never claimed ''the gist of the invention'' to be ''avoidance of deep penetration'' or ''reduction of impact pressure'' as the subject matter of their invention.[235]

The Appeals Court also said that ''Appellants have insisted throughout this case that they regard the subject matter of the patentees' invention to be 'avoidance of deep penetration.' '' Since the matters in this case were handled by lawyers specialized in the field of patent procedure and processing, I would assume that they would be very much acquainted with the requirements contained in § 112 that the claims must contain the subject matter particularly pointed out and distinctly claimed, which the applicant regards as his invention.

[135] The question arises why would the applicants have ''insisted through this case that they regard the subject matter of the patentees' invention to be 'avoidance of deep penetration.' '' [236] In my inquiry of the record as it may or may not have supported the conclusions and findings contained in the prior Opinions, it was apparent that the plaintiffs had insisted at McLouth that the big difference between the Suess et al. patent and the prior art was in the avoidance by Suess of deep penetration as against that of the prior art. But nowhere was it claimed to be the subject matter of the patentees' invention; neither was the term ''to avoid material agitation of the bath by the oxygen stream'' pointed out as the subject matter of the invention. While that term was used, as testified to by the Primary Examiner, there is nothing in the entire patent to indicate that it was used other than in an explanatory fashion. A differentiation from the prior art and as a caution to avoid the faults of the prior art.[237]

[136] The Court of Appeals, as did the McLouth District Court, charged the plaintiffs with attempting to relate the phrase ''avoidance of deep penetration'' and incorporate it in the term of the claim ''. . . to an extent to avoid material agitation of the bath by the oxygen stream • • • and to the phrase '• • • contact of the oxygen with the bath resulting in • • • a localized reaction zone spaced a substantial distance from the refractory lining • • • '.''

The Court of Appeals found that neither of these phrases could be interpreted as limiting the penetration of the oxygen stream to a '' 'practically negligible' penetration.'' Since I have discussed this in connection with my inquiry of the District Court Opinion, it is not necessary that I repeat it here.

However, in the consideration and discussion by the Court of Appeals and its interlinking of the term ''practically negligible penetration,'' I believe that the Court of Appeals, like the District Court, was unaware of the significance of the technologically chemical functioning of the impingement of the oxygen jet upon the metal bath surface, with its further technical chemical consequences. Since I have already

[234] Compendium XVIII, pages 429; (Exhibit PX1, col. 12, lines 12-19).

[235] Compendium XVIII, Page 430.

[236] Compendium XVIII, page 431.

[237] Compendium XVIII, page 431.

elaborated [137] on this phase of the impingement of the oxygen jet and its chemical generation of reactions, I repeat here only that it would seem that by the instructions contained in the specification within its limitations as prescribed, such an impingement causes, first, an indent which lies linearily below the surface of the bath, and that this would satisfy the description of a "practically negligible penetration" of the surface; and second, that the chemical interpenetration between the oxygen atoms and the iron and other atoms in the bath, violated the surface linearity of the molten metal; and that the words in the claim "onto and below taking color from each other placed the position of the jet in relationship to the surface and so this would also satisfy the words of limiting the jet penetration to a " 'practically negligible' penetration to a 'surface layer' penetration." [238]

Here I should explain that the prior Courts had extracted from the affidavits filed with the continuation-in-part application the words " 'practically negligible' penetration". As for the thinking about "avoidance of deep [138] penetration" the Court of Appeals restated what the District Court had said that both Schwarz and Miles places the same limitation on depth of penetration as it related these prior arts to " '• • • a localized reaction zone spaced a substantial distance from the refractory lining.' "

Here again with the Court of Appeals following the thinking of the District Court as it related to the physical application of the deep penetration of the prior art and of the avoidance of the deep penetration of the Suess patent misinterpreted the distinction between the two. The prior art in its reaction zone placed the jet not only on the inside of the bath but also as an elongated oxidizing agent "in the manner of a solid body" placed it all the way from the surface into the bath, and when directed particularly angularly, as was indicated should be done, the jet no longer

[238] Compendium XVIII, at page 432.

became "localized" but rather unlimited, unconfined and uncontrolled as a single phase inducer of chemical action. Whereas, the Suess process placed and controlled it on the surface center of the bath for the purpose of creating a localized reaction zone there in close proximity with the slag. This was reflected by the instruction given in the Suess specification on vertical, central placement of the nozzle, diameter opening of the nozzle, atmospheric pressure of the oxygen jet, distance from the bath and ratio of [139] bath depth to area surface. None of which instructions were contained specifically in combination, particularly, in either Schwarz or Miles. Thus, these facts do not support the statement of the Court of Appeals that ". . . in the instant case we are concerned with a patent *that varies from the prior art only in the alleged degree of penetration of the oxygen stream*" (Emphasis added).

Arguably then, if avoidance of deep penetration was the only element involved in the Suess patent, then why would there have been any need for any other instructions including those just repeated here.[239]

The Court of Appeals decided the fact that the specification nowhere established a standard for determining when agitation becomes material or related the amount of agitation to the depth of penetration and any interpretation one skilled in the art might have placed on "avoidance of material agitation" would not have been the " 'practically negligible' penetration" that the patentees represented to the Patent Office as "avoidance of deep penetration."

[140] It is regrettable that the prior District Court and the Court of Appeals afterwards did not have before them the deposition of the Primary Examiner. For then its understanding of this matter would have been clarified. Thus, if the Court of Appeals had had before it the thinking of the patentees that "material agitation" represented in part

[239] Compendium XVIII, page 434.

only the deep penetration as it provided the stirring, circulating or agitating by the jet in the inside of the bath as it was practiced in the prior art of Schwarz and Miles. Even if the specification of Suess or its claims had contained the words "avoidance of deep penetration," its obvious significance would be as it was found by the Primary Examiner not one of degree of avoidance of penetration but of not injecting the oxygen jet so as to make it function on the inside of the bath. We know, too, that neither Schwarz nor Miles provided measurements of recommended penetration, and that both merely stated that the oxygen agent was to be injected into the bath. However, both Schwarz and Miles made us aware of the fact that it could not be an impingement contact of the oxidizing agent with the surface **[141]** of the bath but one which had to be injected into the bath.[240]

The balance of the Opinion of the Court of Appeals generally dealt with the matter "avoidance of deep penetration" in its various phases of lack of explanatory differentiation from the prior art, lack of definition and limitation, lack of description of this phase as the subject matter of the invention, expanding this phase from the position of the applicants of a " 'practically negligible' penetration" and of the eventual abandonment of that phase of the claimed invention.

The Court of Appeals asserted that the term "deep penetration" and the depth of penetration "can gain meaning only from the limitations placed upon it by the patent and from the knowledge that may be attributed to an ordinary worker skilled in the art." While it is true that the patentees did not specify depth in matter of inches or meters, it must be realized that they could not do so because of the variation in sizes of steelmaking vessels, and because such knowledge would, of necessity, become encompassed in the expertise of the steelmaker. That

[240] Compendium, XVIII, at pages 436-437.

this is so is borne out by **[142]** the Opinion of the District Court that not only could expert steelmakers from McLouth, but also certain experts of the plaintiffs from the instructions given in the Suess specification use the process and make steel. Furthermore, that instructions as contained in the specification could be extrapolated for various size furnaces. Thus, while the depth of penetration is not specified in inches or meters in the Suess specification, it is controlled by the instructions contained in the specification of working within limits, of height of nozzle from bath surface, limits of nozzle opening diameters, limits of ratio of bath depth to bath diameter and vertically or approximately vertically central placement of the nozzle over the bath.[241] Furthermore, these specifications contain the fully detailed, clear instructions and examples which point out the limitations of the invention of blowing an oxygen stream at a pressure between 5 to 25 atmospheres, vertically downwardly through the slag, onto and below the surface of the bath at the central portion thereof, but only to such an extent as to avoid material agitation of the bath by the oxygen stream, **[143]** so that when the contact of oxygen is made with the bath, a chemical reaction results at the place of impingement. Whereupon the oxygen combines with the iron and oxidizable impurities of the bath in what the specification calls the localized reaction zone spaced substantially away from the refractory bottom and walls.

The specification is specific in describing the reactions which result in the exothermic iron-gas evolution which produced a high temperature away from the refractory lining. Here the first activity which eventually produces a circulatory movement in the molten bath as endothermic chemical reactions occurs, and this brings the other portions of the molten metal bath remote from the reaction zone into the reaction zone where they are subjected to the reaction in the localized impingement area for continuing

[241] Compendium XVIII, page 439.

chemical reaction as long as oxygen and oxidizable elements exist for chemical combinations. Under this process the specification assures that the refractory lining will be preserved.

[144] Thus a steelmaker skilled in the art is made aware of what the character of penetration seems in regard to a particular vessel with which he is working and the potential pitfalls of the different prior arts. This differentiation does not require definition by a ruler or a gauge, but rather by all of the instructions of the patent as a whole and by the information which it gives to a person skilled in the art of steelmaking, as well as an indication of the difference of the art he is practicing and the prior art, regarding which he is admonished to avoid of what may be its various faults.[242]

All of this was sufficiently described, particularly as it was directed to the persons skilled in the art of steel-making by testimony in the record of Dr. Hauttmann and Dr. Trenkler.[243] Other circumstances are related by the Court of Appeals and have already been more or less discussed herein. It is important, however, to note that what the Suess process accomplished besides producing steel of a quality equal to that from the open-hearth, it accomplished the seemingly **[145]** insoluable task of saving large quantities of iron in the steel while at the same time eliminated the sulfur and phosphorus from the iron in a way in which the prior art never taught and was never able to do.[244]

One additional matter to which the Court of Appeals referred to in Footnote 11 (400 F.2nd at page 48) inferred that the Gerlafingen blowing experiments were hampered because it did not have an oxygen plant, and because other

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[242] Compendium XVIII, page 441.

[243] Compendium XVIII, page 441-442.

[244] Compendium XVIII, page 445.

factors made experimentation "cumbersome." The statement was made that Linz had "better conditions." There is no evidence in the record that the Linz experimenters possessed an oxygen plant during their experimentation period from early June, 1949 to the end of November, 1950. Their equipment was also home-made as is evidenced by the fact that in the first test the nozzle melted, and in the second test that the water surround broke and sprayed the metal. There were also indications that the experimenters were making make-shift appliances and improvement during the course of their experimentation. Thus, this character of evidence neither adds nor detracts from inventive discoveries which the Linz experimenters made as against the failure of the Gerlafingen experimenters to make inventive discoveries.

[146] Blonder-Tongue Collateral Estoppel Determination

Before reaching a determination on the issues in this case, because the subject matter relates to scientific knowledge and because the Supreme Court has spoken in this regard, I deem it appropriate to keep in mind what Mr. Justice Matthews said in Eames v. Andrews, 122 U.S. 40, 55-56 (1887):

> "It may be that the inventor did not know what the scientific principle was, or that, knowing it, he omitted, from accident or design, to set it forth. That does not vitiate the patent. He sets forth the process or mode of operation which ends in the result, and the means for working out the process or mode of operation. The principle referred to is only the why and the wherefore. That is not required to be set forth."

In reaching a decision here I am convinced without a doubt that the Suess process for the conversion of molten iron into steel is an extraordinary invention. In fact I concur with the District Court's finding that the Suess process was a "revolutionary invention." Neither can I ignore the fact that the veteran oxygen steel experimenter, Dr. Durrer,

stated that "This work shows a new metallurgy with which we must first of all become acquainted." I am aware of the statements of the many experts who testified that they did not believe that such a process by oxygen application to molten iron instead of fuel was possible, and that they could only believe it when they saw it accomplished.

[147] I do not disregard the statements which was made in the McLouth trial that many of the steelmakers throughout the world came as skeptics and went away believing in the process and adopting it. I am also aware of the fact that McLouth, buying know-how and still not convinced, built duplexing equipment at great expense, and after seeing the process in action as they had learned it from the Suess people, became believers and tore down the duplexing equipment.

Althought the accomplishment of this final achievement was in reality the accomplishment of untold numbers of people through the centuries, particularly commencing with the establishment of the first blast furnace in India, Bessemer's air-blowing vessel, and the discovery of the discovery of the Siemens-Martin, or open-hearth furnace, still a great deal of credit is due to the originator of the idea of applying oxygen to the surface rather than from the bottom, as Schwarz and Miles contemplated it and as the outstanding experimenters Durrer and Hellbruegge, in spite of their own failures contributed advice and encouragement to the Linz people.

[148] The true invention came about whether by accident or by perceptive intelligence, when the Linz experimenters brought about a separation of the chemical process practiced in the prior art of Schwarz and Miles into two component chemical parts by the creation of a localized reaction zone at the surface center of the molten bath. Here the first phase of exothermic action was accomplished by the necessary knowledge required for its creation and control; and the second phase resulted in the endothermic

action within the bath where the consequential high temperature created in the exothermic or localized reaction zone brought about, first, the protection of the refractory linings and a prevention of their breakdown so as not to introduce into the bath the harmful manganese as occurred in the prior art, and second, the capability of permitting the iron oxides and other oxides created in the localized reaction zone with the carbon monoxide created thereafter with dissolved oxygen to become a motivating force and cooling device by which the high temperatures created in the localized reaction zone provide additional movement or augment the circulation which had already been created by the chemistry and high temperature in the localized zone.

[149] This discovery brought about a solution of the two prior problems, first, of providing a fast and less expensive method of producing a controlled steel end-product equal in quality to that produced by the open-hearth method, and second, an economical saving of the refractory linings of the vessel. The law required that the process or mode of operation or means for working out the process or mode of operation be set forth with sufficient clarity so that those persons skilled in the art might use and work it to produce the end results. It did not require that no experimentation was to be done; it required only that persons skilled in the art be able to work it to bring about the promised results. This record shows was accomplished so well that it became very quickly the almost exclusive method, world-wide, of direct refining of pig or blast iron into the sought after steel, speedily and efficiently.

The discovery of creating a localized reaction zone at the surface center of the molten metal bath was recognized by the Patent Office as novel and nonobvious to the prior art, as a feature of the new invention. The Patent Office, in fact, **[150]** aided the patent applicants to arrive at wording which would define and explain that feature.

The Patent Office was also aware of the Invention's creation of a localized reaction zone at the top center of the bath and of the necessity not only of permitting any stirring within the bath as in prior art, but also of not disturbing the localized reaction zone by any "material agitation" by the jet. It approved the language finally agreed upon to explain these phenomena as such is set forth in the Claims.

The Suess patent explains the prior art and its difficulties, and thereafter recites its objects directed to persons skilled in the art of steelmaking. It then provides a series of detailed instructions. The preliminaries must be physically prepared and performed by the operator prior to the application of the oxygen jet to the metal, which is also physical in nature. Thereafter it describes the scientific take-over which naturally originates as the oxygen combines in chronological fashion with various oxidizable impurities in the iron bath. And while it asserts the belief that certain circulation occurs in the bath, it provides a scientific step by step explanation of the formation of a localized reaction zone where the high temperatures occur and of the methods by which the high temperatures are sufficiently converted in a secondary function of bringing the balance of the oxidizable material within the bath to the localized reaction zone for the continuing activation of the process until, when the oxidation has been completed, the chemical reaction abates, and the oxygen jet becomes impotent. The patent provides the required **[151]** examples in the specification; and at the end of the specification the patent sets forth its claims wherein the applicants particularly point out and distinctly claim the subject matter which the applicants regarded as their invention, while at the same time differentiating the subject mater from the prior art, and cautioning against interference with localized reaction zone.

As I said before, the evidence is undisputed that persons skilled in the art of steelmaking could use and make the

process in smaller size vessels and could extrapolate the instructions for use and performance in varible and larger size vessels. At the same time the subject matter, which the applicants regarded as their invention, was pointed out and distinctly claimed in such a clear fashion that no one skilled in the art of steelmaking could be confused as as to what the subject matter of the new invention was and of its differentiation from the prior art. Thus the patent was in full compliance with the patent statute which requires that a new invention have the three elements of novelty, non-obviousness and utility as prescribed in 35 U.S.C. §§ 102 and 103, and as well fulfill the requirement of § 112.

[152] On infrequent occasions, judges are confronted with patent cases in which not even skilled experts and professors can so clarify the scientific use of circumstances for an invention as to make it sufficiently perceptible for judicial determination on its technical or technological subject matter and the issues or questions which are raised in litigations in that respect. I believe that this is one of those uncommon cases where this has happened.

After the preliminaries are prepared, according to instructions, and oxygen made to impinge upon and make contact with the metal bath, the specification explains what happens thereafter as chemical reactions from *beginning to end* as detailed in col. 4, commencing with line 43-75, continuing in col. 5, lines 1 through 5 and col. 6, commencing with line 62 and ending with line 72. It will be seen that all of this is chemical. Although the specification does not say in any words or provide any reasonable basis for an inference that the oxygen jet produces a physical or mechanical circulation in the metal bath, the District Court took two words out of their chemical context and interpreted the word "goes" (col. 4, line 55) and the word "diffuses" (col. 4, line 56) as being a physical or **[153]** mechanical activity rather than a result of the chemical

reaction and high temperatures created thereby, the same as is the "flame" (col. 4, line 45) and "fume" (col. 4, line 53), the result of chemical reaction. Thus here was the first misreading of the technical language and the misinterpretation which I believe influenced the District Court to view the invention as being physical or mechanical.

Believing the words of Dr. Durrer that "this work shows a new metallurgy with which we must first of all become acquainted" (257 F.Supp. at page 417), the District Court saw the oxygen steelmaking process at Linz, Austria as "an outstanding invention" and one of "a revolutionary nature". And so being a physical or mechanical invention, the District Court believed that it did what those persons skilled in the art of steelmaking and the experimenters of oxygen to iron had not thought of—and that was changing from a Laval nozzle to a regular nozzle and heightening the nozzle from 10 centimeters above the bath to 15 centermeters above the bath. So that this reduction of impact pressure the District Court concluded avoided the deep **[154]** penetration of the prior art, and thus was the gist of the invention. Convinced of this interpretation and point of view, the District Court while on occasion mentioning other factors, gave little if any regard to the instructed features of the patent and read into the patent the two differences, only, which had been indicated existed between the prior art and the June 25th experiments at Linz.

Although the finding of the District Court that the circulation in the bath was physically or mechanically produced by the oxygen jet, it was nevertheless in accord with the contention of McLouth and the skillful argument of its counsel. And yet the District Court Opinion makes it evident that the supports for this finding came not from McLouth's expert witnesses, but from the negative conclusions drawn from the testimony of the plaintiffs' expert witnesses, and from the "tangible evidence" adduced *sua*

sponte by the District Court from the Ann Arbor demonstrations, particularly Nos. 7 and 9, as such were eventually proved to be misinterpreted both factually and scientifically.

[155] Upon this fallacious basis and thinking the District Court arrived at the finding that the localized reaction zone was a fiction; and that since avoidance of deep penetration was the gist of the invention and that these words were abandoned and not used in the final claims, file wrapper estoppel applied even though other words had been used which "in so many words" provided no causal connection—in spite of such connection by two of the applicants in their filed affidavits. All of this eventually became the thinking and affirmance of the Court of Appeals.

As I previously said that the patent prescribes certain physical functions for the performance of the steel operator and, thereafter, provides for natural, chemically technological functioning as the process generates oxidation reaction in a localized reaction zone, I said that if there is any invention at all it is by this phenomenon by which it can exist. Yet not only was this phenomenon, the localized reaction zone, not recognized by the District Court because of its misconception that it could exist within the bath as in the prior art, and further, because it did not recognize that the prior art **[156]** injection of the jet in the manner of a solid body" or a device to "agitate and circulate the bath" was not comparable to, or identical with the localized reaction zone at the surface center where its two-phase chemistry initiated, the District Court failed to grasp the true invention as it was recognized by the Patent Office Primary Examiner; and by such non-conception it substituted a physical or mechanical theory that "avoidance of deep peneration is the gist of the invention". Thus it also misconceived what was the subject matter in the claim which the applicants were required to point out and claim as their invention. For this reason I could conclude that the file

wrapper estoppel was based upon a factitious set of circumstances and therefore not applicable. However, I have already ruled in this connection and what I said heretofore merely strengthens my own belief that the true invention was miscomprehended. Yet, this is not dispositive of the complete question before me of whether collateral estoppel in accordance with the guidelines of Blonder-Tongue is applicable in these consolidated cases before me.

[157] The law provides than an inventor set forth in the specification "a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same . . ." (35 U.S.C. § 112). However, the specification is sufficient if a mechanic skilled in the art to which the invention pertains can, from the specification, construct and use the invention described. *Woodworth* v. *Wilson,* 4 How. 712, 716 (1846); *Wood* v. *Underhill,* 46 U.S. 1 (1847); *Expanded Metal Company* v. *Bradford,* 214 U.S. 366 (1909). In this connection I considered the matter of McLouth paying $100.000 to Kaiser, one of the plaintiffs, for know-how and as did Jones & Laughlin.

If the specification was explanatory enough for the experts skilled in the art of steelmaking to make and use the process, then why should either McLouth or Jones & Laughlin have paid $100,000 for such know-how?

I conclude, first of all, the process was indeed what Durrer termed it "a new metallurgy" and what the District Court termed it to be "a revolutionary process" and one with which steelmen were unfamiliar and in fact so skeptical that they **[158]** could not believe that oxygen could take the place of fuel as in past steelmaking processes. This made the steelmakers wary so that when it came to expending millions of dollars for the construction of oxygen to iron steelmaking plants concerning which the past history of the

steel industry was completely unknown, the sum of $100,000 paid by each of these was economically a miniscule amount.

The evidence indicates that McLouth (and J & L in the instant consolidated cases) wanted the expertise of Kaiser as a steelmill builder for the construction of the kind of plant which would most conveniently and best accommodate the new process.

Thus, know-how did not present a tangible question, particularly in the face of the fact that the expert steelworkers at McLouth admitted on various occasions that they were able from the instructions of the specification to make and use the process and to extrapolate it according to various sizes of tonnage vessels as required. Thus, also, this does not bear upon the question of whether or not the matter of estoppel is applicable in these consolidated actions.

[159] I have also considered a very serious question of whether the patentees had had a full and fair chance to litigate the validity of their patent in the McLouth trial, whether by reason of fault of their own they were deprived of crucial evidence or witnesses in the first litigation (*Blonder-Tongue* v. *University Foundation, supra,* at page 333). While I have observed that in its Opinion the District Court had been persuaded to some of the contentions by McLouth counsel, it was not persuaded on certain others. I observed that this was true in the same way in consideration of some of the plaintiffs' contentions. But two matters are of concern to me and received my special attention, when the District Court arrived at certain findings as these were presented by plaintiffs' expert witnesses or argued by plaintiffs' counsel. As for instance, the District Court found that "throw-out" from Ann Arbor Demonstration No. 7 was "agitation" of the bath instead of "turbulence" as it was used in the specification, signifying the overall activity both physical and chemical of the process while in the course of oxidation. I noted this difference from the "agitation" as it was used in the specification, as a chemical resultant

[160] and also in its activating or causative sense to augment the bath circulation. I distinguished this from the other and only use in the patent in connection with its physical causative significance as it was used in the claim of the Suess patent.[245] I observed that there was no confusion in the specification of their respective uses; that there was, as in other terms contained in the patent, exclusivity about their positioning in the context where they lent specific significance of what the patentees intended to convey to persons skilled in the art of steelmaking.

And yet I observed that two of the plaintiffs' experts used the term "agitation" on two occasions particularly in the same way as did the District Court. On one occasion, Dr. Chipman was asked in cross-examination (R. 945):

> "Q. Now, when there is penetration of the molten bath by the jet, and there is resultant splash, there is creation of considerable stirring or agitation within the bath as a result, isn't that so Doctor?
>
> A. There is considerable agitation as a result of the action that you describe, and an even stronger agitation as the result of the explosive formation of the CO bubbles."

[161] Here we see Dr. Chipman picking up the words used by his questioner and answering the question in kind. However, on the whole of Dr. Chipman's testimony, I observe that it pretty well confined the use of the word "agitation" in its claim significance.

On another occasion when Dr. Elliott was under direct examination (R. 6273-6276), he discussed the "relatively small" circulation after the lance had been withdrawn. He was afterwards drawn into a discussion of the "hot spot" or the "localized reaction zone" as "they caused

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[245] Compendium XII, page 218.

circulation" in the bath. He referred to this "as a second reaction of importance, that is the reaction between iron oxide, FeO and carbon in the bath to form CO gas and iron." As to the rapidity of these actions he referred to a picture presented by Dr. Chipman of the character of the violence or the reaction of carbon in the bath with iron oxide on the surface. He then said "There is considerable agitation, action when this occurs." However, this incidental use of the word "agitation" as it signified the total action of the bath as the word "turbulence" was used in the specification in its resultant sense was not mistakable, and should not be confusing when read in the light of the specification and the claims of the Suess patent.

[162] Concerning whether or not there was fault on the part of the plaintiffs, I considered the submissively respectful attitude of plaintiffs' counsel in the final argument as he attempted to introduce the various combination features or factors of the Suess patent process, and as he attempted to emphasize the significance of the "localized reaction zone". From all of this I deliberated whether or not counsel's seeming agreement in part with the District Court constituted some fault on the part of the plaintiffs themselves. As for example, as was mentioned in the District Court's Opinion (257 F.Supp. at page 425), counsel for the plaintiffs stated (R.13, 187-13, 188), "'They [the patentees] learned that you have to avoid the deep penetration; • • • in other words, they had to reduce the impact pressure. • • • They arrived at this thought: . . . Maybe we've got to cause this oxygen to impinge on the surface of the bath with a lower impact pressure and avoid stirring the bath by the oxygen stream . . .'" Thereafter plaintiffs' counsel said the gist or the primary difference between the prior art process and the L-D process was that "You avoid deep penetration." He also said not **[163]** too literally that "'The affidavits point out that the crux of the invention was reducing the pres-

sure of the oxygen on the melt so that you did not have this deep penetration.' " However, counsel for the plaintiffs did not leave it at that, when he said, " 'Well, I think, as I pointed out the other day in our main brief, we pointed out a number of other distinctions between Schwarz and Miles.' " I noted elsewhere the numerous, various attempts which counsel made to bring to the attention of the District Court the other instructed factors which made up the localized reaction zone.

In good conscience, I must recognize the fact that even with highly skilled practioners, such as were the counsel on both sides in the McLouth case, over-emphasis is a common fault of counsel as they endeavor zealously to serve their clients. This should not be condemned. However, should counsel in a case be overly agreeable and fail in clarifying factual or legal issues when they arise. It is expected of him that where he believes a judge is in error that he persist in orderly **[164]** fashion to sufficiently attempt a clarification of such an error or misunderstanding or non-understanding, if he can.

Such arguments of counsel on both sides did not misguide the District Court. It was the master of its own thinking when it interpreted the Suess patent and correlated it to the prior art patents of Schwarz and Miles, and even of Potts.

Unlike criminal cases where a defendant must know and be agreeable to what his attorney says before he can be held responsible for the attorney's remarks, the plaintiffs here would be held accountable for what their counsel stated. However, when we look at the efforts which counsel for the plaintiffs made to endeavor to bring to the court's attention the technical factors which constituted the Suess patent process, I could not consider them as misleading. This is particularly so because the specification must be read and translated in the ordinary literal and scientific manner as it was intended by the inventors

and as they addressed the patent to persons skilled in the art of steelmaking. And when so read and translated, it would negate any erroneous statemnts made by counsel. We must take what counsel for the plaintiffs said as a whole, and **[165]** when so taken, it appears doubtful that he caused the District Court to find as a fact that the *only* inventiveness about the Suess process was "avoidance of deep penetration" or that the *only* significance about the new invention was the lessening of impact pressure. Accordingly, I cannot attribute this as a fault to the plaintiffs, also in view of the fact that the District Court took out of context certain words from the specification explaining the chemistry involved and interpreted them to be not chemical but physical in significance as its incipient thinking.

Thus, I am of the opinion that it was not what counsel stated which influenced the District Court to find that "avoidance of deep penetration is the gist of the invention." Rather it used its own interpretation of the specification and its own scientific findings, which it termed "tangible evidence in the record" as well as the other findings in relation to the non-credibility of the plaintiffs' expert witnesses. These contributed to the District Court's determination that avoidance of deep penetration is the gist of the invention and that because these words were not included "in so many words" in the claim, the patent was invalid.

[166] In considering whether the patentees had a full and fair chance to litigate the validity of the patent at McLouth, I firmly believe that the subject matter presented issues "so complex that legal minds without appropriate grounding in science and technology [had] difficulty in reaching decision". *Blonder-Tongue, supra,* at page 331. I believe that with the incipient interpretation by the prior District Court that mechanical action produces the gist of the invention, it failed to recognize the specific instruc-

tions in the specification for bringing about the true invention of localizing the reaction zone at the surface center of the bath as a metal-chemistry discovery, and so found the localized reaction zone to be a fiction. This failure of chemistry interpretation influenced the District Court to hold *sua sponte* that the doctrine of file wrapper estoppel prevented the patentees from availing themselves of its assumed finding that "avoidance of deep penetration was the gist of the invention", and further that the words so used to clarify the significance of the localized reaction zone and its differentiation from prior art, as suggested by the Patent Office Primary Examiner, presented a **[167]** serious defect of equitable dimensions. This was so particularly because *Blonder-Tongue* subsequently could work a collateral estoppel against the plaintiffs from any further actions otherwise previously permitted by *Triplett, supra.* Certainly, in any event, in this sense the plaintiffs were, regrettably, deprived without fault of their own, of the right or privilege of presenting crucial evidence in the prior case.

Thus such a prior proceeding was seriously defective and its review by the Appeals Court without correction of the serious defect by the District Court struck down a patent in the United States which was recognized as valid throughout the rest of the world. In this connection it is important to note the reference by the Supreme Court in *Blonder-Tongue, supra,* at page 331, footnote 21, where it quoted from *Sinclair & Carroll Co.* v. *Interchemical Corp.,* 325 U.S. 327, 330 (1945): "It is just as important that a good patent be ultimately upheld as that a bad one be definitively stricken."

[168] I am firmly convinced that the prior McLouth case was one of those uncommon and infrequent cases to which the general principle of collateral estoppel should not apply. I am of the belief that it would be an injustice

to apply the doctrine of collateral estoppel here, in view of the fact that the Constitution and the statute, as well as judicial law, intend to encourage inventiveness and protect it, when genuine, against the many anxious competitors who stand ready to appropriate such new discoveries without having earned it or given consideration for its use and benefits. I deem it a matter of justice and equity based upon facts and law that collateral estoppel in accordance with the guidelines of *Blonder-Tongue, supra,* is not applicable in these consolidated cases before me.

Accordingly, the plea of estoppel raised by the defendant, Jones & Laughlin, in these consolidated actions will be denied.

[169] This Opinion Compendium and Opinion Summary constitutes Findings of Fact and Conclusions of Law in accordance with the requirements of Federal Rule of Civil Procedure 52(a). The parties may submit further proposed Findings of Fact and Conclusions of Law consistent with this Opinion and an appropriate Order shall be submitted.

OPINION COMPENDIUM—COLLATERAL ESTOPPEL

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I. Introduction

[1] Two consolidated patent actions, Civil Action 61-551 and Civil Action 62-272, are here before me for licensing, validity and infringement determinations. These actions are based upon the Suess et al. Patent No. 2,800,631, issued for a process for refining of molten metal with high purity oxygen.

In the first action the plaintiff, Kaiser Industries Corporation (Kaiser) charges the defendant, Jones & Laughlin Steel Corporation (J&L), with a breach of contract and seeks to recover royalties allegedly due under a license agreement (PX-7A) covering two steelmaking converters at the defendant's steel mill in Aliquippa, Pennsylvania. The second suit is brought by the plaintiffs, Kaiser (a Nevada corporation), Vereinigte Oesterreichische Eisen-Und Stahlwerke Aktiengesellschaft (VOEST) and Brassert Oxygen Technik Ag., (BOT) (an Austrian corporation) against the defendant J & L (a Pennsylvania corporation) and alleges infringement of the Suess et al. patent by reason of the unlicensed operation of two converters in its Cleveland mill. Both actions were originally filed in the United States District Court for the Northern District of Ohio, Eastern Division and transferred to this District pursuant to 28 U.S.C. 1404(a) by Orders of the Honorable James C. Connell, dated September 14, 1961 and April 9, 1962, respectively. These cases were consolidated here. The defendant J & L not only raised a series of defenses to the complaints, but also claimed damages for antitrust violations by the plaintiffs.

The determination of the issues raised in the original [2] pleadings in these two consolidated patent actions must, however, be held in abeyance until the issues raised later by the amended pleadings of the parties and the threshold question of estoppel by virtue of the authority contained in *Blonger-Tongue Laboratories, Inc.* v. *University of Illinois Foundation et al.*, 402 U.S. 313 (1971) are fully inquired into and determined.

These later issues involve prior proceedings, with virtually identical subject-matter to these J & L cases, which had been brought by the plaintiffs on July 19, 1957 in the Eastern District of Michigan against an alleged patent infringer, McLouth Steel Corporation. In *Kaiser* v. *McLouth Steel Corp.*, 257 F. Supp. 372 (1966), the District Court decided against the plaintiffs. This decision was affirmed, *Kaiser* v. *McLouth Steel Corp.*, 400 F. 2d 36, C.A. 6, 1968. The Supreme Court denied certiorari, *Kaiser Industries Corp. et al.* v. *McLouth Steel Corp.*, 393 U.S. 1119 (1969).

Prior to *Blonder-Tongue* the applicable law was that set forth in *Triplett* v. *Lowell*, 297 U.S. 638 (1936), to the effect that the prior adjudication of invalidity of claims asserted in an earlier action does not preclude successive litigations concerning the same issues against different defendants, and courts whose jurisdiction is invoked by subsequent suits for infringement of the patent must separately determine the validity of each claim and are not bound by the prior ruling of the other court.

Blonder-Tongue Essentials

On May 3, 1971, the Supreme Court, for the most part abrogated this rule of law and, only for reasons of justice [3] and equity, made limited bases for the admission of justiciable actions to a subsequent court by a previously unsuccessful patentee plaintiff. The holdings in *Blonder-Tongue* were intended to eliminate duplicitous litigation where a patentee could harass different defendants in other jurisdictions. Such practices were condemned as being not only unfair, but as being unsound judicially and economically. In this connection Mr. Justice White stated:

> "Permitting repeated litigation of the same issue as long as the supply of unrelated defendants holds out reflects either the aura of the gaming table or 'a lack of discipline and of disinterestedness on the part of the lower courts, hardly a worthy or wise basis for fashioning rules of procedure.' *Kerotest Mfg. Co.* v. *C-O Two Co.*, 342 U.S. 180, 185 (1952)." (402 U.S. at page 329.)

In a word, after a review of the evils and disadvantages existing under the patent procedure law of *Triplett*, the Court in *Blonder-Tongue* declared that ruling to be no longer procedurally appropriate. However, the Supreme Court continued that pro forma stating:

> ". . . we do not suggest, without legislative guidance, that a plea of estoppel by an infringement or royalty suit defendant must automatically be accepted once the defendant in support of his plea identifies the issues in suit as the identical question finally decided against the patentee or one of his privies in previous litigation." (402 U.S. at pages 332-333.)

Rather, the Supreme Court prescribed a series of rules by which it anticipated a justiciable patentee claimant would not be barred from proceeding in a subsequent action on the same subject matter. That these rules contemplated extraordinary and rare circumstances seemed to be contained in what was an [4] obvious safeguard against any injustice which might accrue in a normal collateral estoppel defense. Such safeguards included the right of a patentee plaintiff to demonstrate if he can, that he did not have "a fair opportunity procedurally, substantively and evidentially to pursue his claim the first time" (402 U.S. at page 333). In this connection the Supreme Court asserted that

> "This element in the estoppel decision will comprehend, we believe, the important concerns about the complexity of patent litigation and the posited hazard that the prior proceedings were seriously defective." (402 U.S. at page 333.)

In the case where the issue is non-obviousness,

> ". . . appropriate inquiries would be whether the first validity determination purported to employ the standards announced in *Graham* v. *John Deere Co., supra;* whether the opinions filed by the District Court and the reviewing court, if any, indicate that the prior case was one of those relatively rare instances where the courts wholly failed to grasp the technical subject matter and issues in suit; and whether without fault of his own the patentee was deprived of crucial evidence or witnesses in the first litigation."

In discussing the guidance rules in subsequent litigation, the Court said:

> "We are also aware that some courts have frankly stated that patent litigation can present issues so complex that legal minds, without appropriate grounding in science and technology, may have difficulty in reaching decision." (402 U.S. at page 331.)

Quite logically the Court followed this with the statement that even in cases so difficult "as to provoke a frank admission of judicial uncertainty, one might ask what reason there is to expect that a second district judge or court of appeals would be **[5]** able to decide the issue more accurately." (402 U.S. at pages 331-332.)

Nevertheless, after analyzing the pros and cons of the patent litigation situation of the past, the Court concluded:

> "But as so often is the case, no one set of facts, no one collection of words or phrases, will provide an automatic formula for proper rulings on estoppel pleas. In the end, decision will necessarily rest on the trial courts' sense of justice and equity. . . .
>
> This is especially true if the court in the second litigation must decide in a principled way whether or not it is just and equitable to allow the plea of estoppel in the case before it." (402 U.S. at pages 333-334.)

Accordingly, with the pronouncement of *Blonder-Tongue* on May 3, 1971, patent trial judges became bound by the

new procedure laid down in that case with the exceptions noted. As of that date, I had already expended the principal time necessary for actual trial work in hearing the evidence of both the plaintiffs and the defendant in these consolidated actions and had already become involved in post-trial matters following the actual hearing of the evidence.

In the first of the two actions before me, the main issue concerned an alleged breach of contract of a patent on the method of converting molten blast furnace iron into steel by the application of high purity oxygen to the molten iron surface. The second of these actions was brought by the plaintiff on the charge of alleged infringement of that patent. Extensive discovery procedure had been availed first by the defendant and afterwards by the plaintiffs over a period of several years, much of which was delayed by reason of the fact that other discovery **[6]** was proceeding in the parallel *McLouth* case in the Eastern District of Michigan. That case was first made ready for trial and eventually did come to trial before the instant actions here. Nevertheless, the parties agreed to sit in and stipulate on all portions of the evidence presented in the Eastern District of Michigan which might be admitted into evidence or otherwise made a part of the record of these cases without actually again calling the same witnesses. I considered the cooperation of counsel in that respect highly commendable.

I had been informed by counsel for the parties that the actual trial of the Eastern District case took approximately fifteen months. The trial proceeded before me for approximately 48 days spread over a period of several months.

It was during the time while we were here engaged in post-trial processes that the District Court for the Eastern District of Michigan handed down its decision and filed an Opinion declaring the patent in question in-

valid. Shortly afterwards, the plaintiffs petitioned for leave to present additional evidence in these consolidated cases such as would clarify the alleged errors or insufficiencies of the prior District Court holdings. Later, the Court of Appeals for the Sixth Circuit affirmed *Kaiser Industries et al.* v. *McLouth Steel Corporation, supra;* and the United States Supreme Court denied certiorari.

The principal disagreement that the plaintiffs here have against the prior decision was that the *McLouth* District Court, *sua sponte,* made a determination that the plaintiffs had abandoned the critical concept of avoidance of deep penetration in their claim before the allowance of the patent and accordingly [7] the principle of file wrapper estoppel applied.[1] The plaintiffs complained that the sua sponte decision was reached without suggestion by the defendant, and without giving the plaintiffs an opportunity to be heard.

The principal evidence presented before me on that matter at a supplementary hearing related to what occurred in the Patent Office at the time the patent application was being negotiated.[2]

It comprised the testimony of the Primary Examiner who allowed the patent and the attorney for the applicants.

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[1] "It is a rule of patent construction that a claim in a patent must be read and interpreted with reference to claims that have been cancelled or rejected and the claims allowed can not by construction be read to cover what has thus been eliminated from the patent." *Schriber-Schroth Co.* v. *Cleveland Trust Co.,* 311 U.S. 211, 220-221 (1940); see also *Trio Processing Corporation* v. *L. Goldstein's Sons, Inc.,* 461 F. 2d 66, 75 (3d Cir. 1972), *cert. denied* 49 U.S. 997 (1972).

[2] The hearing on the issue of file wrapper estoppel was held on April 29, 1970, and constituted the testimony of Byron Gardner, Esq., who was attorney for the patent applicants, and the deposition of Claude A. LeRoy, primary examiner, which deposition will hereinafter be referred to as PX-1002, and all references to the first post trial hearing transcript will be marked "FWE". (File wrapper estoppel)

Primarily the additional evidence presented before me, at the first post trial hearing, dealt with the treatment of the claims in the Patent Office and in various conferences which transpired, because the claims had been rejected. Eventually there was agreement upon acceptable terminology in the claims. The patent was thereafter allowed on June 27, 1957 and issued on July 23, 1957. Following this additional presentation at the first post trial hearing, briefs were filed and arguments heard.

While I was in the post-trial stages of procuring, examining and researching suggested findings of fact, the briefs, and the record, and further researching of such law as the briefs contained, the Supreme Court on May 3, 1971 handed down its [8] pronouncement in *Blonder-Tongue, supra,* which provided for a fundamental departure of procedure from *Triplett, supra.* Following that, the defendant was granted leave to amend its answer to include a defense of collateral estoppel as provided for by *Blonder-Tongue;* and in short order the plaintiffs filed their reply.

At the second supplemental hearing,[3] the plaintiffs argued that *Blonder-Tongue* made the evidence presented at the first supplemental hearing on the file wrapper estoppel even more crucial. Secondly, the plaintiffs argued that the *McLouth* District Court had, by the many and various misstatements contained in the Opinion, shown a fundamental misunderstanding and misapprehension of the technical aspects of the patent specification and claims, and had therefore misconstrued and misapplied the scientific evidence produced before it by the experts in the case. In support of this contention, the plaintiffs produced an expert witness here who testified that he had made certain statements at *McLouth* but that the District Court had misconceived such scientific evidence, as was apparent from

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[3] The hearing on the issue of collateral estoppel was held on September 7, 8, 9, 1971, and all references to the hearing transcript will be marked "CE" (collateral estoppel).

the conclusions contained in the Opinion. Additionally, at the second hearing patent experts testified on the issue of file wrapper estoppel.

Following these hearings several arguments were presented before me by counsel for the parties who were granted leave for **[9]** filing such supplemental documents as they desired and considered helpful.

Thus it was, that while I had been assigned two consolidated actions in which the issues were breach of contract, patent validity and infringement, antitrust violations and possible damages, these issues were for the time being superseded as a matter of law by this intermediate but more fundamental issue.

Before, however, I have any right to even commence considering the fundamental issues thus presented, it is incumbent upon me to not only understand what that authority is but its limitations as well. While the Supreme Court presented representative examples and illustrative guides, it as well conveyed its understanding that it would be humanly impossible to cover the whole gamut of potential problems which might arise and confront a district court. As it said,

> "But as so often is the case, no one set of facts, no one collection of words or phrases, will provide an automatic formula for proper rulings on estoppel pleas." (402 U.S. at pages 333-334.)

And so, a subsequent trial judge is put on notice that he may not only meet up with unpredictable circumstances, but that he must also be prepared to judicially administer them. However, until judicial authority has finally defined the guide rules and mandates laid down in *Blonder-Tongue*, a subsequent judge in any such patent cases must be prepared to make appropriate determinations as are required under the circumstances of the case over which he presides.

Although a considerable number of legal questions are here involved, there are also even more highly technical questions **[10]** involved. I say this because noteworthy University of Michigan experts were in considerable disagreement with equally eminent authorities from the Massachusetts Institute of Technology.

From my meticulous examination of the Opinions filed by both the *McLouth* District Court and the Court of Appeals in conjunction with an even more scrupulous examination of the specification and inquiry into the testimony of the expert witnesses, I am amazed that a trial judge, at the end of it all, would not become truly perplexed. This in no way derrogates from the high competence and extreme effort earnestly manifested by the prior participating judges and particularly that demonstrated by the untiring adherence of the District Court to an arduous assignment.

Chief Judge Henry J. Friendly of the Court of Appeals for the Second Circuit in his book "Federal Jurisdiction: A General View" (1973) in recommending a specially trained and scientific court for the administration of patent matters, presents an apt discussion in this regard. He said (at page 156-157):

> ". . . the courts must also deal today with a great number of patents in the higher reaches of electronics, chemistry, biochemistry, pharmacology, optics, harmonics and nuclear physics, which are quite beyond the ability of the usual judge to understand without the expenditure of an inordinate amount of educational effort by counsel and *of attempted self-education by the judge, and in many instances, even with it.* The judges who hear the case in a suit for infringement on appeal are no better off except for the benefit they can derive from the district court's opinion. Indeed, save in this respect, they are rather worse off since the limited time available for argument prevents their getting as much assistance from counsel as did the district judge and, once the argument is over, it is cumbersome to

have further recourse to counsel for help on technical matters that may assume new importance as a result of study." (Emphasis added)

Mr. Justice White recognized this in *Blonder-Tongue,* in the [11] following words:

"We are also aware that some courts have frankly stated that patent litigation can present issues so complex that legal minds, without appropriate grounding in science and technology, may have difficulty in reaching decision." (402 U.S. at page 331.)

The Court recognized that this same dilemma might just as easily face the subsequent trial judge, when it said:

"But assuming a patent case so difficult as to provoke a frank admission of judicial uncertainty, one might ask what reason there is to expect that a second district judge or court of appeals would be able to decide the issue more accurately." (402 U.S. at pages 331-332)

It is no great secret that the background education of those preparing for the legal profession includes very limited scientific study. This fact is constantly proved by the background information which the many applications for law clerk service divulge. But even with some scientific background education, in particular chemistry, knowledge has changed and expanded so radically in the past few decades that any judge who might have had any basic training in that science would have to become re-educated. So, too, the advent of using high purity oxygen as a substitute for the open-hearth furnace in the purification of iron has not only improved the steel industry but has presented it with a new kind of metallurgy with which even the steelmakers of the late 1940's had to become acquainted,[4] as we shall see. That the *McLouth* District Court performed not only a gigantic task but a highly abstruse one is demonstrated [12] by the record itself.

[4] DX-110-E.

That the *McLouth* Courts were required not only to preside over, inquire into, and make determinations on chemical and metallurgical phenomena which had intrigued and baffled the experts, required that the Judges assume a course of study for themselves, presumably with the participants in the case as their teachers.

In this sense, I was in no better position than were the Judges in *McLouth,* except that by reason of the later issues joined, I was made aware of my inadequacies in these sciences. Thus, I realized that the prior Judges were compelled to make determinations on the basis of credibility of witnesses in scientific disputes and that the Court relied almost totally on the testimony of the experts often in derogation of accepted technical, scientific principles and axioms.

Accordingly, I re-examined these scientific assertions when the experts' conclusions clashed with what my research revealed to be scientific principles and attempted to extract scientific facts from the published authorities on the subject. Where I did this, I endeavored to cite such authorities. I earnestly deliberated on whether or not consideration and reliance upon such scientific authorities might be considered erroneous as substituted testimony, but finally determined that justice required this of me under the circumstances of the case.

I was encouraged in this course, by what Mr. Justice Swayne stated in *Brown et al* v. *Piper,* 91 U.S. 37, 42 (1875):

"Of private and special facts, in trials in equity and at law, the court or jury, as the case may be, is bound carefully to exclude the influence of all [13] previous knowledge. But there are many things of which judicial cognizance may be taken. 'To require proof of every fact, as that Calais is beyond the jurisdiction of the court, would be utterly and absolutely absurd.' Gresley's Ev. in Eq. 294. Facts of universal notoriety need not be proved. See Taylor's Ev. § 4, note 2. Among

the things of which judicial notice is taken are the law of nations; the general customs and usages of merchants; the notary's seal; things which must happen according to the laws of nature; the coincidences of the days of the week with those of the month; the meaning of words in the vernacular language; the customary abbreviations of Christian names; the accession of the Chief Magistrate to office, and his leaving it. In this country, such notice is taken of the appointment of members of the cabinet, the election and resignations of senators, and of the appointment of marshals and sheriffs, but not of their deputies. The courts of the United States take judicial notice of the ports and waters of the United States where the tide ebbs and flows, of the boundaries of the several States and judicial districts, and of the laws and jurisprudence of the several States in which they exercise jurisdiction. Courts will take notice of whatever is generally known within the limits of their jurisdiction; and, if the judge's memory is at fault, he may refresh it by resorting to any means for that purpose which he may deem safe and proper. This extends to such matters of science as are involved in the cases brought before him. See 1 Greenleaf's Ev. 11; Gresley's Ev., supra; and Taylor's Ev. § 4 and post."

Our Supreme Court constantly refers to published authorities on the many subjects which come before it for determination. So, too, the *McLouth* Judges had a perfect right to rely upon published authorities in aiding them to ascertain the scientific truths particularly where such matters were disputed by the experts. The *McLouth* Opinion does recite published authorities as these were admitted as exhibits in evidence; as for instance, MPX-104,[5] **[14]** a news letter which relates to the new use of oxygen (257 F.Supp. at page 380); and MPX-98-D, a steel magazine

[5] All *McLouth* exhibit references shall be preceded by "M", as "MPX" or "MDX." This particular exhibit appeared only in the *McLouth* proceedings and also appears in the Plaintiffs' appendices to their Petition for Writ of Certiorari at page 265a. See PX-L-3.

article reprint, which reveals that "sixty-four companies in twenty-three countries have installed the new oxygen steelmaking processes, or are now doing so." (257 F.Supp. at page 386, footnote 2.) Yet the District Court reflected some reliance upon published authority, because it chided Dr. Chipman and Dr. Shapiro for their evidence on "An 'explosive bubble' mechanism" because it "was admittedly not contained in any literature prior to the time of trial." It, therefore, refused to credit this scientific demonstration presented in evidence [6] as proof because, although the "explosive bubble" mechanism showed chemically induced circulation downwardly, such "would not have been a fact known to persons skilled in the art in 1950, since at that time there was no general knowledge among steelmakers of reaction induced circulation." (257 F.Supp. at page 438) Although this example may point some indication on value of published authority, there were bound to be likely instances where published authority could indeed be critical.[7]

As of the time when I presided over the trial of these actions, I was not aware of most of the scientific facts as they **[15]** came to me subsequently and slowly from references to scientific books during the period of my inquiry into the *McLouth* Opinions and records. Thus, hindsight proved to be a teacher for me which was unavailable to the *McLouth* Judges.

While I am in duty bound to inquire into the functioning of the prior *McLouth* Courts and to, in effect, delve into their very thought-processes, I am not a review court and nothing that I say or do here can in anywise affect the

[6] Actually the plaintiffs presented a series of explosive visible demonstrations activated by means of squibs, acetylene in glass tanks filled with water.

[7] This reference is to where I discuss 3000-8000 to 1, Opinion Compendium XI, page 213 and Up and Down At The Same Time, Opinion Compendium XIV, page 271.

determinations of the *McLouth* proceeding. The judgments rendered in that case lie undisturbed. My task is to make an adjudication whether or not the judgments rendered in the *McLouth* proceeding constitute a collateral estoppel against the plaintiffs here.

Starting with such preliminary explanations as I have here presented, it is now appropriate that I present as briefly and as intelligibly as possible something of the subject matter, its background and the questions involved.

Iron and Steelmaking

The subject matter with which this litigation is concerned is a technique employed in "the conversion or purification of iron into steel". Three essential elements are critical to the process of steelmaking—iron, carbon and oxygen. We are told that early man obtained iron from meteorites, but since it was a hard mass and malleable, that is capable of being extended or shaped by beating, he learned to make considerable use of it. It is believed that as time went on man slowly learned how to make these hard masses by burning certain "soil" in wood fires. **[16]** The "soil," of course was iron ore. Later man began to depend upon this substance for conversion into articles of ornament and utility. He learned too that hammering it gave more durability; at least as good as flintstone, or copper with which he had become acquainted even earlier.

The first furnace for reducing iron ore to mass formation is said to have originated in India about 2000 B.C. Its use was subsequently widespread in Europe and even in this country during its early years, and particularly in Pennsylvania and Ohio where the forests provided an abundance of carbon fuel in the form of charcoal, nearby to easily available iron ore, and a constant supply of 20% oxygen in the form of air. However, man was not satisfied with the crude or pig iron that these methods brought him and sought to improve them.

The first device of importance was conceived and developed by Sir Henry Bessemer in the mid 1850's, and presented the first revolutionary idea in a pneumatic converter for the further purification of pig iron. The converter consisted of a bowl-like vessel which was tiltable on trunions and had an opening at the top. A number of tube-like tuyeres were built into the bottom. Through these tuyeres high pressured air was blown into and through the molten iron. The forced collision of the air with the oxidizable materials in the molten iron produced a speedy oxidation between the oxygen in the air and the impurities in the iron, which could be observed from the fiery blast from the mouth of the vessel. The Bessemer process was both speedy and efficient, so far as it freed the iron of silicon and manganese **[17]** and carbon, but it did not eliminate sulphur or phosphorus and it retained unwanted nitrogen from the air in the finished steel.

The Thomas converter which was used mainly in Europe was the result of the work of two Englishmen, Thomas and Gilchrist, in 1876. They discovered that if the converter is lined with certain basic materials and charged with burnt lime in the pig iron, the slag which forms absorbs the phosphorus oxides produced by the blast furnace. Although the Thomas converter, or as it is sometimes called the acid Bessemer converter, is more efficient, particularly in Europe where the iron ore contains a great deal of sulphur and phosphorus, the steel which it produces also retains an undesirable high nitrogen content.

Another vessel which was developed for refining iron is the electric furnace or converter. The difficulty with this process is that it is an expensive one requiring a great deal of electric power to operate.

Of the very many systems which have been developed over the past decades the Siemens-Martin or open hearth process has been the most popular. It was discovered in the 1870's or 1880's, and by 1954 it accounted for approxi-

mately 85% of the steel produced in the United States. The open hearth process requires fuel oil or natural gas to provide the necessary heat required for oxidizing the impurities contained in the molten metal bath. The steel produced in the open hearth is superior to that of the Bessemer or Thomas methods, and is far more economical than the electric furnace, but it is a comparatively slow process and involves a substantial outlay of capital for its construction **[18]** and operating costs. Originally the open hearth method took approximately eleven hours to provide the finished steel which was required.

Subsequently certain operators used duplexing processes by which the blast iron was put through the Bessemer furnace and thereafter poured into the open hearth. By duplexing, the time required was cut almost in half. Still later, additional improvements were made which reduced the round-trip time of loading, boiling and emptying the contents of the open-hearth furnace to a four or four and a half hour period, with the use of pure oxygen.

Role of Oxygen Recognized

By the start of the 20th century steelmakers were aware of the harmful effects which atmospheric nitrogen did to the finished steel product, and that it was the oxygen in air which by its combining power with certain elements produced the great heat required in the refining of iron into steel. In 1928 the Linde-Fraenkl process for producing economically large quantities of oxygen by compressing air and causing the oxygen and nitrogen to separate was developed and made possible for experimentation of iron conversion with the use of oxygen enriched air.

Dr. C. V. Schwarz, a German working at the Technical Institute in Austria during the 1930's, made application for a patent on the theory of blowing oxygen or enriched oxygen air onto the surface of and into the interior of

the bath. After this he was issued a patent in 1943. (DX-5-A).

Dr. Robert Durrer had, in 1929, been a professor at **[19]** Technische Hochschule at Berlin, in which laboratory he had performed refining experiments with oxygen and later he had co-experimented with Dr. Schwarz. In fact Dr. Durrer claimed that the Schwarz patent contained and covered his ideas. In any event, this was the first idea that had come forth for applying high purity oxygen or oxygen enriched air to the surface of the bath. However, Dr. Schwarz in his patent, after asserting that surface contact was not sufficient to produce the rapid reaction which was the object of the invention advocated that the oxygen or oxygen enriched air be brought into as intimate contact with the bath as possible. The process could also be run with oxygen enriched air, carbon enriched air, or pulverulent solids introduced into the liquid bath by means of liquid gases. These were to be applied "with such a high kinetic energy that it was capable of penetrating in the manner of a solid body deep into the interior of the bath by the use of extremely high velocities lying preferably above the speed of sound." (DX-5-A, Page 2, lines 6-9.)

So, Schwarz said that the injected jet must act like a solid device, and he asserted that the oxygen forced into the molten metal would come in contact with all of the elements throughout the bath, and thus the impurities would be oxidized. Schwarz presented few, if any, instructions on how to accomplish the process. Although Schwarz had made application for a patent on his theory in Germany in 1939, he was not issued a patent until 1943. And although he was associated with institutions concerned with steelmaking there is no evidence in the record that the process had been put to commercial use. If the invention which **[20]** Schwarz claimed he had perfected had been operable, it surely would have been employed during World

War II when steel was in high demand for the production of equipment and materiel. The absence of such evidence lends credibility to Dr. Durrer who testified at the *McLouth* trial that the Schwarz patent failed to yield any practical results. (PX-510, p. 5085.)

In 1946 John Miles and Partners (London) Limited applied for a Belgian patent which was granted on November 30, 1946. The Miles patent was little different in processing from that of Schwarz, but it contained considerable detail. Miles advocated the use of a liquid jet composed of from about 70 to 98 percent oxygen, that is blown deeply into the bath at an angle between 30 and 75 degrees. Miles also advocated utilizing more than one jet to penetrate deeply into the bath so as to stir the contents. He also taught the introduction of heat producing substances so as to raise the bath temperature. As in the case of Schwarz, there is no evidence that the Miles process was adopted by the steel industry in Europe or anywhere else. Also like the Schwarz situation, Dr. Durrer testified that the Miles patent did not yield practical results (PX-510, p. 5085).

The record indicates that in the late 1940's Dr. Durrer was still unconvinced that there was a practical method by which oxygen enriched air or pure oxygen could be utilized in refining iron. Because of this, Dr. Durrer, together with Dr. Hellbruegge began a series of experiments in 1948 at Gerlafingen, Switzerland and continued this work through 1949. These experimentations dealt with the Schwarz, Miles and Durrer theories. Some of the **[21]** products which were produced were utilizable for limited purposes. The expense involved, however, was prohibitive because the refractories as well as the oxygen nozzle were destroyed. The poor quality of steel being produced prevented the adoption of this system of oxygen application as taught by Schwarz and Miles and as experimented upon by Drs. Durrer and Hellbruegge.

At about the time that Drs. Durrer and Hellbruegge were experimenting at Gerlafingen, the Austrian Government decided to reconstruct its steel industries which had been demolished by bombardments of the Allies in World War II. There were four men in the employ of the Austrian Government who had familiarity with steel production. They were Dr. Theodor E. Suess, Dr. Herbert Trenkler, Dr. Hubert Hauttmann and Dr. Rudolf Rinesch. Both Drs. Suess and Trenkler were familiar with the experimentation which was being carried on by Drs. Durrer and Hellbruegge, and it was arranged for Dr. Trenkler to visit Gerlafingen to observe the experiments being conducted. The results of such experimental work proved to be unsatisfactory because of the high phosphorus and high oxygen content in the steel and because of the necessity of an afterblow in order to remove the phosphorus, and furthermore, difficulties were being encountered with the linings of the vessel and the burning of the nozzles. Dr. Durrer, however, informed the Austrians of his faith in the idea of pure oxygen application for the conversion of iron into steel, and encouraged them to continue the experimentation at Linz, Austria. Following his advice, the Austrians determined to experiment further with the Schwarz and Miles ideas.

They thereupon set up a two-ton vessel at Linz, Austria **[22]** (PX-424, p. 2225) and improvised a nozzle surrounded by water for cooling effect, inserting it directly down to the bath. The first test amounted to no test at all because the closeness of the nozzle to the hot metal melted and clogged it. (PX-424, p. 2228; PX-508, p. 11,933.) During the second test, however, the casing containing the water broke and sprayed water onto the surface of the metal. (PX-424, pp. 2228-2231.)

The experimenters noticed that at the end of the second test they produced a fairly good grade of metal. After inquiry into this success, they decided upon a two pronged

course of experimentation; first they would follow the teachings of Schwarz, Miles and Durrer and Hellbruegge and, at another time, follow their own conclusions of what may have caused the better product in Test 2. Commencing on June 17, 1949, the series of tests according to the prior art were performed and produced unsatisfactory results (PX-424 pp. 2249-2250). The metal was inadequate and the refractories were quickly destroyed. After relining the vessel they commenced a series of tests with their own method on June 25th and perceived better results in the metal and refractory wear. (PX-424 pp. 2249-2250; PX-508 pp. 11,899-11,904.) From there on a long series of experimentation consisting of 250 tests were carried on until November 1950. This involved all kinds of variables and charging vessels up to 30 tons.

From these tests they became convinced that they had a practical process for high purity oxygen conversion of iron into **[23]** high grade steel. On January 31, 1950, Dr. Suess, believing that he had sufficient knowledge to file an application for a patent, did so in Austria. Dr. Suess based the application upon his conception that a controlled ratio of both depth to surface area favored a circulation within the bath. However, this was only a part of it as became apparent with the later filings. The Austrians, however, continued their experimentation until November of that year.

On January 16, 1951 (PX-2B) Suess filed an application in the United States Patent Office and based it upon theories and instructions which remained practically unchanged until the time when the patent was finally issued. However, the Patent Office was not convinced that this patent with a varied series of claims was not anticipated by Chiswik, Brassert, Cuscoleca and Miles, (all of which were later disregarded.) Because of the dissension among the inventors and their employers in Austria, litigation hindered the progress, particularly in the United States. However, after the litigation was settled in 1955, the four

applicants filed a continuation-in-part application and two affidavits defining the invention and differentiating it from the prior art, particularly that of Miles.

The matter was referred by the Examiner to the Primary Examiner for negotiation of the wording. The earlier claims stated that the method avoided deep penetration of the bath by the oxygen jet. Inasmuch as the prior art emphasized the **[24]** necessity for the jet of whatever composition to be injected deeply within the bath and thus cause it to physically stir the molten metal, the concept of deep penetration had become universally understood by steelmen (PX-1002).

The Primary Examiner objected to the language "avoid deep penetration" (PX-1002 p. 7) for two reasons: (1) that the Patent Office practice attempted to avoid the use of negative limitations (PX-1002 p. 7); and (2) that the prior art theory had become too well known by steelmen and that there was no need for using these differentiating words (PX-1002, pp. 8-9). The Primary Examiner believed that the wording of the claims should express the subject matter of a localization of the oxidizing factor at the central surface area (PX-1002, pp. 8, 28). Thus he approved the wording that the discharge of oxygen under specific limitations of pressure, height, nozzle diameter and the like, should be made to such an extent as not to interfere with the localization of the oxidation process at the central surface of the bath and thus not materially agitate the bath. With such change of wording in the claims as they constituted the first and second claims, the patent was granted.

Immediately upon the applicants' perfecting the method, it became highly successful and desirable throughout the world (257 F. Supp. at page 398). In the United States alone, sixteen mills were built almost immediately (257 F. Supp. at page 380). Since 1955 or 1956 very few new open-hearth furnaces were constructed. (257 F. Supp. at

page 380). The reasons given were **[25]** that first, on the basis of economy the original capital outlay for installing a basic oxygen mill was a fraction of that of the open-hearth; secondly, the time of production was tremendously different—where originally the open-hearth took eleven hours to process the iron ore into steel, or perhaps one-half of that time if the Bessemer process was used, the basic oxygen production actually took from twenty to thirty minutes and a much shorter time for the preparation of a new melt as soon as the furnace product was tapped; and thirdly, the finished product of the basic oxygen process was facile, at least comparable in quality to that of the open-hearth, and could be produced within various compositions.

Certain changes of ownership occurred in the patent rights during the early years. In this country assignees of the Suess patent rights entered into an agreement with Kaiser on May 20, 1954 (PX-5 B & C) by which Kaiser was granted all licensing rights for the use of the Suess process throughout the United States. On November 12, 1954, Kaiser entered into an agreement to give know-how, engineering knowledge and consultation services concerning the process to McLouth at a cost of $100,000. (257 F. Supp. at page 385). In their main brief the plaintiffs at *McLouth* (PX-K-1 at page 15) stated that negotiations with Kaiser and McLouth continued until November 19, 1954, at which time McLouth accepted a proposal that Kaiser was to provide McLouth with know-how relating to the process in issue, **[26]** including drawings, engineering and metallurgical data, consulting services and advise and general supervision over the initial stages of the operation. Kaiser agreed to review in detail the design of McLouth's converters and to provide persons who would assist in training McLouth's operators and establish good operating practices during the initial phases of the operation. Kaiser also granted McLouth an option to obtain a license under the patents covering the process. In the

meantime, McLouth being skeptical of the Suess patent's efficacy built a duplexing plant in the event that this process under the Suess patent proved to be a failure. However, with the total success of the patent process, McLouth disassembled the duplexing plant and produced steel by the oxygen application method. (257 F. Supp. at page 399). With McLouth's failure to perform according to the contract, the plaintiff Kaiser entered suit to recover damages for patent infringement. McLouth argued unsuccessfully that a licensing agreement had been entered into. When this issue was ultimately decided against McLouth, the patent infringement trial commenced. In a similar manner, one *J & L* case involves a licensing agreement which is not contested here. Thus, in *J & L* the issues are breach of licensing agreement and patent infringement.

McLouth raised a series of defenses, the relevant one here being (1) that the Suess patentees were not the inventors of the process but had copied the prior art of Schwarz and Miles; **[27]** (2) that McLouth was manufacturing steel in their basic oxygen furnace vessels by means of deep penetration of the oxygen into the molten metal bath according to the prior art of Schwarz; and (3) that the specification and claims of the patent in suit did not comply with 35 U.S.C. § 112.

On February 4, 1956, (PX7A) the defendant J & L in these proceedings entered into an agreement with Kaiser for the construction of a basic oxygen plant at its Aliquippa works and for instruction on the know-how of the procedure of the process as well as for licensing. J & L paid the first payment of $285,000.00 (PX472, p. 1203) and thereafter refused to abide by the Agreement. Additionally, J & L installed a basic oxygen furnace at Cleveland, Ohio without any agreement. In response to plaintiffs' suits concerning these, J & L in essence adopted the McLouth defenses; that the Suess patent had been anticipated by Schwarz and Miles; that J & L used deeper penetration

than did the Suess experimenters in June 1949; and that because the the plaintiffs were not the owners of any process either by invention or assignment, they had no patent rights against the defendant. Other defenses were raised which are not at this time material. Thus it is obvious that these consolidated J & L cases involve the identical subject matter as the *McLouth* cases.

In its Opinion dated July 6, 1966, the McLouth District Court found that the Suess et al. patent was not anticipated by prior art; that it was not obvious to prior art except insofar as chemical **[28]** reactions occurred within the interior of the bath; that the prior art did not provide utility; that the Suess et al. patent did provide utility; that the Suess et al. patent was a revolutionary invention; that the intermediate impact pressure of the oxygen jet upon the molten metal bath surface was the gist of the invention, because it avoided the deep penetration of the prior art; that the applicants had originally claimed "avoidance of deep penetration" as the gist of their invention, but that subsequently they abandoned this terminology in favor of "to such an extent as to avoid material agitation of the bath by the oxygen stream" with which there was no casual connection; and that accordingly the patent was invalid. (257 F.Supp. at page 372).

The *McLouth* District Court in relevant part, ruled:

> "Therefore, the well-established doctrine of file wrapper estoppel prohibits a construction of the claims finally approved by the Patent Office as containing a concept expressed in language previously rejected by the Patent Office and then abandoned by the applicants." (257 F.Supp. at page 427).

Ultimately its judgment of invalidity was based upon the fact that:

> "In this Court's opinion, the Suess et al patent in suit, No. 2,800,631, is invalid under 35 U.S.C. § 112 for failure of the claims to particularly point out and distinctly claim the subject matter which the applicants regarded as their invention." (257 F.Supp. at page 442)

On appeal by the plaintiffs the Court of Appeals for the Sixth Circuit disagreed almost entirely with the District Court, **[29]** but affirmed on the basis of the fact that the District Court had declared the Suess et al. patent invalid. (400 F. 2d 36, C.A. 6, 1968).

As noted above, the McLouth defense rested largely on two grounds: one, that Suess patentees did not invent the process which they claimed, and two, that neither the specification nor the claims of the patent complied with the requirements of the patent statute, 35 U.S.C. 101-112. However, these are divided into a large number of points concerning which the plaintiffs and the defendant offered evidence and arguments. A short resume of the prior art Schwarz and Miles is necessary to clarify the basis of these disputes.

The Schwarz Patent (DX-5A)

The first paragraph of the Schwarz patent reveals its theory and purported methodology. This reads as follows:

> "If liquid baths, for instance metal baths are to be treated with gases, it is important *to bring the reactants into as intimate contact with each other as possible. Surface contact is not sufficient* in most cases to produce a rapid reaction, such as the blowing of the gas over the surface of the bath or the mere blowing of the gas onto the surface of the bath. The blowing of the gas through the bottom or wall of the container and the bath or the *blowing of the gas into the bath* by means of a pipe *naturally results in substantially stronger contact of the reactants and thus a substantially faster reaction,* but in many cases it cannot be employed for technical and practical reasons." (Emphasis supplied) (DX5A, page 1, lines 1-10 and page 2, lines 1-2).

How the "intimate contact" of the gas and the metal is to be made is contained in the first sentence commencing on page 2:

[30] "The object of the present invention is a method of bringing gases into particularly *intimate contact* with liquid baths, for instance metal baths, by providing the jet of gas directed onto the surface of the bath *with such a high kinetic energy that it is capable of penetrating in the manner of a solid body deep into the bath* by the use of extremely high velocities lying preferably above the speed of sound. In this way it is possible, . . . to cause the jet of gas to act *within the liquid baths* so that the reaction takes place extremely rapidly and completely." (Emphasis supplied) (PX-A p. 2, lines 3-13).

The patent recites that it was known to the prior art that

> ". . . a high blast inlet velocity, possibly of a speed lying above the speed of sound is necessary, in order to conduct the air through the bath in as compact a jet as possible." (PX-5A, p. 2, lines 15-17).

However, this use was only known in introducing it in the bottom of the converters as

> ". . . it was not possible to obtain from this proposal the idea, when treating liquid baths, for instance metal baths, with gases, to cause the jet of gas to impinge on the surface of the bath with such a high velocity that *it was capable of penetrating into the bath in the manner of a solid body.*" (Emphasis supplied) (PX-5A, p. 2, lines 19-24).

So, too, it was known by prior art that alkali compounds could be introduced "in the form of a thin stream under the action of high pressure vertically or obliquely into a metal bath." (PX-5A, p. 2, lines 25-26, p. 3, line 1). However, it was not known that it was also possible "to conduct a jet of gas from above in such a manner onto a liquid bath *that it was* [31] *capable of penetrating into the interior of the bath.*" (Emphasis supplied) (PX-5A, p. 3, lines 2-6). This method could be applied "for the refining of iron and steel melts." (PX-5A, p. 3, lines 20-22).

The patent recites that the various drawbacks, which are encountered by lateral blowing, are not encountered by this oxygen enriched air or oxygen method, and so rapid wear of the container liner is eliminated, because "local overheating and accumulation of ferrous oxide, takes place in the center of the steel bath and therefore the walls of the vessel are not substantially attacked." (PX-5A, p. 4, lines 19-25, p. 5, lines 1-2). It also results "in exceptional advantages, namely the speed of refining or decarburization of steel melts can be very considerably increased . . ." (PX-5A, p. 5, lines 4-12). The method also permits the introduction of "pulverulent solids" into the liquid bath by means of gases and provides "a good distribution of these substances . . . particularly in case of varying direction of the jet." (PX-5A, p. 5, lines 13-17). Evidently the reason that these advantages occur, the patent indicates, is because "The gas can in this case *exert an action* of its own *on the liquid bath,* but may also serve merely as vehicle and carrier for the solids." (Emphasis supplied) (PX-5A, p. 5, lines 17-19).

Thus, the jet was not only a means for conveying the exygen or oxygen enriched air pulverulent solids to within the bath, but [32] also to penetrate "in the manner of a solid body deep into the bath" and provide "a good distribution of these substances . . . particularly in case of varying direction of the jet." Thus Schwarz used the jet as a mixing device. It alleged an improvement particularly over the prior Bessemer and Thomas converters.

The Schwarz patent claims (1) a "Method of treating liquid baths, for instance metal baths, by gases directed against the surface, characterized by the fact that the jet of gas which is directed against the surface of the baths has *such a high kinetic energy that it is capable of pene-*

trating deep, in the manner of a solid body, into the liquid baths''; and (2) that "the jet of gas which impinges with high kinetic energy on the surface of the bath and *penetrates into same serves as vehicle and carrier for solids* which are to be introduced into the baths." (Emphasis supplied) (PX-5A, p. 5, lines 20-25, page 6, lines 1-6). Although the patent suggested a method, it did not provide any instructions for its performance.

The Miles Patent (PX 10-A)

The Miles patent was substantially similar to Schwarz, but provided considerably more detail and several possible methods of utilization. The most notable of these variations was that a liquid rather than gas jet be employed, the liquid having a greater potential for penetration. It also suggested that:

> "Several suitable jets located in the furnace can be used simultaneously and if desired each of them can be given a *vibrating motion* so as to **[33]** cover a larger surface of the bath. The jet serves to *circulate and agitate* the metal and slag." (PX-10A, p. 18, lines 5-9) (Emphasis added).

Miles, like Schwarz, also recommended the addition of "carbon . . . in the form of pulverized coal injected into the furnace at high speed either together with the oxidizing fluid or by separate nozzles." (PX-10A, p. 11, lines 11-13). It also suggested that "the heat can also be produced by suitable additions either to the jet or to the metal. Thus one can blow in, with the jet, or by other means, such as a separate gas feed, a readily oxidizable element (metal or alloy), that is to say an element which has a high heat of oxidation, such as carbon, silicon, aluminum, calcium, magnesium or other metals or alloys." (PX-10A, p. 15, lines 9-14).

Miles, like Schwarz, proposed by his method to obtain a high temperature *within* the interior of the bath and

suggested that the purpose for adding these oxidizable elements "is to increase the temperature locally where the jet strikes the bath so as to bring about the oxidizing action more rapidly." (PX-10A, p. 15, lines 15-16). Miles suggested a number of diverse applications in various vessels including Siemans-Martin or open-hearth furnace. The patent asserts that

> "In accordance with the invention, the refining process consists *in injecting into the molten metal*, by a blast, an oxidizing fluid at such speed that a sufficient proportion of the fluid *penetrates into the metal to react there* on the oxidizable impurities and eliminate them from the metal . . ." (Emphasis Supplied) (PX-10A, p. 2, lines 5-9).

The main idea of the patent may be found in these excerpts:

[34] "The oxygen-containing fluid can be projected from top to bottom onto the surface of the metal to be treated at such speed that the major part of the fluid jet *penetrates into the bath*. The velocity of the fluid at the surface of the metal required to cause this substantially *complete penetration* must necessarily vary in accordance with the circumstances in each case." (Emphasis supplied) (PX-10A, p. 2, line 21, p. 3, lines 1-5).

"The speeds of this order of magnitude are desirable in order to obtain an optimum penetration and effect of the fluid . . ." (PX-10A, p. 3, lines 11-13)

"The high speed of the fluid jet has the effect that the *source of chemical oxidation reactions is located within* the bath at a good distance from the refractory lining of the furnace." (PX-10A, p. 3, lines 17-19).

"The penetration of the jet also fulfills the useful function of *agitating the bath*, so that the reactions take place uniformly and to the maximum extent." (Emphasis supplied) (PX-10A, p. 4, lines 4-6).

In the case of applying the process to the Martin furnace (open-hearth), the statement is made that

> "The jet is directed from top to bottom upon the surface of the metal at a velocity which is sufficiently high to assure the penetration of almost all the fluid into the bath. The *jet serves to maintain a vigorous agitation* so that the oxidizing reactions follow one another *in the interior of the bath* at a very high speed and with a very high chemical yield of oxygen." (Emphasis supplied) (PX-10A, p. 10, lines 3-8).
>
> "The high speed jet causes *a vigorous agitation* and an entrainment of the slag *in the body of the metal*, thus assuring *an intimate mixing and rapid* reactions." (Emphasis supplied) (PX-10A, p. 13, lines 11-13)

Certain specifics are set forth in Miles which are absent in Schwarz. For example, Miles taught: (1) the blast so to be injected into the molten metal as an oxidizing fluid containing **[35]** not more than 30% nitrogen and a quantity of oxygen between 70% and 98% (PX-10A, p. 2, lines 5-11); and (2) that it is "desirable in order to obtain an optimum penetration and effect of the fluid" and to provide "a nozzle of 0.32 inches inside diameter, the tip of which is 6 inches above the surface of a bath of molten cast iron requiring a gas pressure of 7 or 8 atmospheres to deliver about 10,000 cubic feet of gas per hour into the bath at a speed of about 1250 feet per second" (PX-10A, p. 3, lines 6-13).

Miles says that "the preferred percentage of nitrogen is between 5% and 25% and at the present time the cost of oxygen which contains this percentage of nitrogen is relatively low and *does not prevent the industrial application of the invention.*" (PX-10A, p. 5, lines 2-5) (Emphasis supplied). (3) It further provides that the nozzle be placed "at any angle between 15° and 90° with respect to the horizontal, but preferably between 30° and 75°, . . ." (PX-10-A, p. 17, lines 11-12); (4) ". . . while the distance from the jet to the metal and/or the slag should be between 1 and 20 inches, preferably between 4 and 12 inches." (PX-10-A, p. 17, lines 12-14).

A series of 17 claims incorporate "A process for the refining of molten metal by the projecting of an oxidizing fluid into the metal at a velocity such that a sufficient proportion of the fluid penetrates into the metal to react there with the oxidizable impurities of the metal"; it is "characterized by the fact that the fluid employed does not contain more than 30% nitrogen and a proportion of oxygen between 70% and 98%"; that **[36]** "the fluid is projected into the metal at a velocity which is not less than 1250 feet per second"; it is further characterized by the fact that "the oxidizing fluid is used as a vehicle to bring a heat-generating substance such as a carbonaceous material *into* the bath"; and it is also characterized by the fact that the process may be applied in various kinds of converters. (PX-10-A, pp. 20-23).

It is not necessary to detail here all other matters set forth in the Miles patent. Yet certain pertinent similarities, as well as differences, do exist with Schwarz as well as with Suess.

The important fact here is that in both Schwarz and Miles patents the jet or jets were to be used as devices for mechanically agitating or stirring the bath and thus as activating the oxidation reactions for the iron refinement within the bath. In both processes additives were included to produce the high temperature within the interior of the metal bath (Schwarz, PX-5-A, p. 4, lines 24-25); (Miles, DX-10-A, p. 3, lines 17-18). Each viewed the process as a speedy method of refining iron into steel. Each claimed that high temperatures were created within the interior of the bath, and that accordingly, the refractories remained undamaged.

There is no evidence in the *McLouth* record, if in fact any does exist, of the quality of steel which either Schwarz or Miles produced. However, it must be presumed that since oxidation would naturally take place within the molten metal bath that a certain amount of refinement of the crude iron would **[37]** result. There is, however, undisputed evi-

dence from certain of the plaintiffs' witnesses, and from one of the defendant's witnesses, Dr. Durrer, that the Schwarz patent did not produce practical results. (PX-510, p. 5085). He likewise testified that the Miles patent did not yield practical results (PX-510, p. 5085).

There is considerable evidence in the *McLouth* record that the forced activation of the jet in Schwarz and Miles did considerable damage to the refractories, particularly to the sidewall opposite that from which the jet initiated. This is better exemplified in the experimentation of Dr. Durrer and Dr. Hellbruegge at Gerlafingen, since the testimony is undisputed that these two experts were experimenting during the years 1948 and 1949 in accordance with the processes of Schwarz and Miles.

Gerlafingen—Durrer & Hellbruegge

As general manager of Von Roll from 1946-1951, Dr. Durrer lived in Gerlafingen (R. 5004). In 1947, he called on Dr. Hellbruegge to work with him in Gerlafingen, because as Hellbruegge stated, "I had been his assistant, and I had devoted my time to the utilization of oxygen in the making of steel, and this had been the reason why Professor Durrer had called me." (R. 4524).

At Gerlafingen, Hellbruegge's work centered around top blowing with oxygen (R. 4525; 5013). In May of 1949, Trenkler went to Gerlafingen to observe the work being performed there (R. 4532-33; 5016). While there he observed the use of a bent water-cooled lance with a Laval tip (R. 4552; 4561). Hellbruegge **[38]** testified that he told Trenkler that the "lance was to impinge upon the bath in its center." (R. 4596). Both Durrer and Hellbruegge testified that they told Trenkler that the steel they were producing was comparable to open hearth steel (R. 4600; 5026). It was thereupon decided that the Gerlafingen work should be reproduced at Linz (R. 5026).

Dr. Durrer testified that the problem of refining with high purity oxygen had been solved in principle at Gerlafingen (R. 5025). Not only is this conclusion extremely ambiguous and overbroad, it appears to be contradicted by the fact that Durrer sent a congratulatory letter to Suess on May 5, 1950 (DX-251-E) stating:

> "I had not expected you to be able to solve this problem so quickly, and am therefore all the more delighted, now that I have been able to see the beautiful results with my own eyes. Now that the problem has been solved in principle . . ."

and a memorandum of a discussion with Dr. Suess on December 10, 1949 (DX-110-E).

Furthermore, during a speech at Leoben in May 1949, Durrer urged investigating the conversion of iron into steel by high oxygen fluids. Specifically, he stated, "these ideas are still in the developmental stage, but already they indicate the direction which should be taken." (R. 5097-98). Furthermore, in a letter dated May 28, 1949, Durrer spoke of refining pig iron by blowing oxygen as the "great problem." (R. 5099).

In order to understand the attitude of Dr. Durrer as he testified for the defendant McLouth, we refer to this in the District Court Opinion:

> **[39]** "Dr. Durrer testified at the trial that the Schwarz patent contained his ideas. (R. 5101.)
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> • • • • • • • • • •
>
> Dr. Durrer affirmed the similarity of his teachings to those of the Schwarz patent, regardless whether Dr. Durrer himself was the true inventor of the process claimed in the Schwarz patent. (R. 5100-5101.)" (257 F. Supp. at page 408).

The Opinion comments that there was disputed evidence regarding the solving of "Gerlafingen problems of refractory damage," and remarked that Dr. Hellbruegge in his

Stahl and Eisen article (DX-61, p. 14) stated that in the Gerlafingen operations there were no difficulties with respect to the durability of the nozzle, nor of the converter. The District Court Opinion then said

> "On the other hand, Dr. Trenkler testified that he was told at Gerlafingen that Dr. Durrer and Dr. Hellbruegge had initially encountered difficulties concerning an insufficient life of the nozzle and an extremely short life of the refractory lining lasting only one to two heats." (257 F.Supp. at page 414).

The Opinion then adds that the early experimentation of the patentees consisting of the June 17th series of tests confirmed that problems of refractory damage existed at Gerlafingen, and "had not been completely solved." (257 F.Supp. at page 414).

The Opinion also remarks on the doubtful success at Gerlafingen since Dr. Durrer had testified at the *McLouth* trial that Schwarz' work gave no practical results in the refining of pig iron into steel by the oxygen method. Thus, since Dr. Durrer's ideas were contained in the Schwarz patent and as it was followed at Gerlafingen, those ideas "would also have led to no practical results." (257 F.Supp. at page 417). Further comment is made that neither Dr. Durrer nor Dr. Hellbruegge apparently sought a patent themselves on the basis of the Gerlafingen **[40]** tests and neither did Dr. Durrer's company. And yet being aware of the Suess patent applications in Austria and Switzerland, no oppositions to the Suess applications were filed anywhere in the world. (257 F.Supp. at page 417).

Persuasive evidence comes, however, in communications from Dr. Durrer as he registered surprise at the good results of the Linz work and declared in his December 14, 1949, memorandum (DX-110-E) that "This work shows a new metallurgy with which we must first of all become acquainted. Presumably, the extensive removal of these substances is due to the higher temperature, the higher degree

of liquidity connected therewith, and the higher reaction velocity resulting therefrom." (257 F.Supp., p. 417). This is corroborated by the letter of congratulations dated May 5, 1950 (DX-251-E) when Dr. Durrer wrote to Dr. Suess and stated, inter alia,

> "I had not expected you to be able to solve this problem so quickly, and am therefore all the more delighted, now that I have been able to see the beautiful results with my own eyes. Now that the problem has been solved in principle . . ."

The prior art, knowledge and accomplishment culminated in this work at Gerlafingen prior to the beginning of experimentation by the patentees at Linz, Austria in June 1949. Thus, for whatever the Gerlafingen experience might have contributed, the *McLouth* record evinces no basis for the patentability of the methods practiced there.

[41] *Suess et al. Application and Claims (PX-2)*

The Suess et al. application and claims for which a patent was finally granted on July 23, 1957, may be divided into several parts.

First, in the first two paragraphs of the first column, the general adaptability of the patent is set forth;

Second, in the balance of the first column and through line 35 of the second column, the prior art knowledge of pneumatic blowing in refining iron processes and its attempts with high purity oxygen in the refining of the molten metal charges, as well as its failures, are outlined;

Third, the objects of the patent are enumerated in the balance of the second column and continuing on into the third column through line 15;

Fourth, in the balance of column three and continuing through column 12 to the claims, the description of the process, findings, instructions, theories of why and how

the process functions, comparisons to other processes and examples, and results, are set forth;

Fifth, the claims are stated.

In the first division, the patent states,

> ". . . the invention relates to a process for the refining of molten metal with high purity oxygen blown downwardly onto the surface of a bath of the molten metal" (Col. 1, lines 21-24).

Under division two are summarized the attempts to blow high purity oxygen in Bessemer and Thomas converters with the **[42]** resulting destruction of the refractory bottom within a short time of one heat, and attempts that were made to blow high purity oxygen from tuyeres positioned in the walls of the vessel above the melt line.

> ". . . the horizontal velocity component of the oxygen jet as the melt surface [caused] the development of excessively high temperatures above and at the melt-slag interface on the side of the vessel opposite the tuyeres or oxygen jet inlet so that a rapid deterioration of refractory occurs." (Col. 1, lines 49-54).

Additionally, a loss of oxygen efficiency resulted due to the deflection of the gas from the melt surface.[8] More than sufficient heat resulted which interfaced with the chemistry of the process, the life of the refractory lining being severely curtailed, so that they had to be restored after a short period of use. And so, "there remains no economical, commercially feasible process for refining of molten metal with high purity oxygen capable of providing long refractory life and high oxygen efficiency." (Col. 2, lines 25-28).

Under division three, the object of the process is to move the reactions between the oxygen gas and the molten metal and limit them to "an oxygen jet impingement area removed from the refractory lining of the reaction vessel"

[8] (Col. 1—lines 55-56)

(Col. 2, lines 50-52). Another object is to provide "controlled refining at substantially theoretical oxygen efficiency" (Col. 2, lines 56-57). Further goals are to provide "an exceptionally high refractory life." **[43]** (Col. 2, line 61), and "to provide a process of surface blowing molten pig iron with high purity oxygen" for the avoidance of an "over-oxidation of the molten pig iron bath." (Col. 2, lines 63-68). The process also is to provide a high purity oxygen method for "widely varying chemical compositions" in pig iron used in ordinary basic open-hearth practice, acid Bessemer and basic Thomas converters *"to produce steels having analyses and qualities at least comparable to that of basic open-hearth steels."* (Col. 2, lines 69-72, Col. 3, lines 1-5). (Emphasis added), and "to provide a high purity oxygen refining process for production of steel of excellent quality at a high rate of production" comparable to that produced in the Bessemer or Thomas converters. (Col. 3, lines 5-12).

Under the next division, the process is explained as one in which "the high purity oxygen jet is blown vertically, or approximately vertically upon the central portion of the surface of a bath of the molten metal" with a jet having a diameter and static pressure as is later specified and spaced from the bath surface such that direct contact of the oxygen jet and the molten metal is established and maintained throughout the refining period without deep penetration of the molten metal bath by the jet. (Col. 3, lines 36-47). Thus, the patent asserts that "the area of *jet impingement is controlled to produce a relatively confined zone of direct oxygen to molten metal contact* with respect to the total surface area of the bath." (Emphasis supplied) (Col. 3, lines 46-49). Thereafter, there is **[44]** detailed instruction on the static pressure and the overhung blast nozzle and the indication that it "produces a sufficiently high reaction velocity of the oxygen with the bath constituents to insure the development of autogenous heat a at rate sufficient to provide the heat required for completion of the refining in

a minimum of time, consistent with controlled temperature and control and development of other necessary and required process conditions, such as fluid slag, avoidance of over-oxidation (undue loss of iron to the slag), and avoidance of slopping." (Col. 3, lines 49-72).

Thereupon it is stated that "*the process conducted under these conditions avoids a deep penetration of the oxygen gas into the molten bath* which seriously impairs refractory life at the bottom of the refining vessel. In addition, the impingement area of the high purity oxygen on the central portion of the bath isolates the refractory walls of the refining vessel from the *extremely high temperatures which are developed by the direct reaction of the oxygen and the molten metal.*" (Col. 3, lines 73-75, col. 4, lines 1-6) (Emphasis added). Further it is asserted that "according to the invention . . . the utilization of suitable design of reaction vessel and the use of the proper amount of material charged results in a ratio of the depth of the bath to the surface area of the bath which augments the protection afforded to the refractory lining of the refining vessel and is also beneficial to the progress of the refining reactions *to produce finished steels of low impurity content* **[45]** *comparable to those produced by the basic open-hearth process.*" (Col. 4, lines 7-15) (Emphasis added). Numerical illustrations are made for the provision of a vessel so as to contain a ratio of bath depth to surface area in square meters of from about 1 to 5 to about 1 to 28, or specifically in the case of a circular bath a ratio of depth to diameter of from 1:2.5 and 1:19 with similar ratios for other sized vessels. (Col. 4, lines 15-25).

In the next paragraph the patentees hypothesize their theory of circulation in the following words:

> "Although it is not intended to limit the present invention to any specific theory of action or mechanism, it is believed that application of the oxygen jet substantially vertically or approximately vertically upon the central portion of the bath surface brings about a flow in the molten metal from the center of the surface of the bath downwardly and then along the bottom of the refining vessel, and upwardly at the sides of the vessel to the surface of the bath, so that portions of the unrefined metal are continuously presented to a localized center of direct oxygen reaction with the bath metal, while reacted or oxidized portions of the bath move away from this reaction center. This apparent circulation of the molten material is facilitated by shaping of the bottom of the device in its refractory lining in a uniformly curved design, preferably hemispherical or similar shape, so as to offer the minimum of resistance to the circulation." (Col. 4, lines 26-42).

The patentees proceed to a declaration of the scientific action which is produced upon "initial contact of the high purity oxygen jet with the molten metal bath":

> "Due to the very high affinity of oxygen for iron, initial contact of the high purity oxygen jet with the molten metal bath causes a rapid combination of oxygen and iron to form FeO in the confined central reaction zone. This is demonstrated by ignition of the oxygen and the propagation of a visible flame within the first minute of blowing. This reaction, **[46]** together with oxidation of impurity elements, such as silicon and manganese, develops extremely high temperatures in the zone of direct oxygen contact with the molten metal which approach the boiling point of iron, as demonstrated by the evolution of a fume containing iron oxide and manganese oxide. A portion of the iron oxide goes to the slag with the other oxidized elements and a portion diffuses into the bath under the influence of the bath circulation, so that within the first three minutes of the blowing vigorous carbon combustion is initiated due to the high temperatures developed by these reactions. The ensuing reaction of carbon with the FeO and directly with the oxygen gas in the confined direct oxidation zone causes rapid formation of carbon monoxide and the formation of this CO causes a strong boil or agitation of the bath, which augments the bath circulation to continuously present unrefined metal to the oxygen gas reaction zone and to create a slag-metal emulsion. The oxygen jet thus contacts the emulsion

of bath and slag components which presents a larger reaction surface and causes the refining reactions to progress rapidly although the oxygen jet does not penetrate deeply into the molten metal bath and is confined to an impingement area at the central portion of the bath surface. This vigorous boiling action is opposed by the pressure of the oxygen jet only in the area of impingement, and outside of this area it represents primarily endothermic reduction of FeO by carbon to form the evolved carbon monoxide, which reaction thus effectively encompasses the zone of direct oxygen reaction at which the highest temperatures prevail affording a maximum measure of protection to the refractory lining of the refining vessel." (Col. 4, lines 43-75, Col. 5, lines 1-5).

In the next paragraph comparative examples are given of the longer life "In conducting the process and in the manner set forth above" of over 200 heats as against 35 to 60 heats in the Bessemer converter process and of total refractory consumption in the instant process of about 24 pounds of refractory brick per ton of steel as against 36 pounds of refractory brick per ton of steel in the open-hearth process. (Col. 5, lines 6-29).

There follows an explanation of the calculated oxygen **[47]** efficiencies as well as an explanation of the resultant chemical effects produced by "efficient utilization of oxygen" (Col. 5, lines 30-59). The relationship between chemical reactions and the localization of the reaction zone is explained:

> "*As above mentioned, it is a characteristic of the process of the invention that in the confined zone of direct oxygen reaction at the surface of the molten metal bath,* the oxidation products of the impurities in the pig iron, such as silicon and manganese, as well as the oxidized iron form an early fluid slag which is always very rich in oxides, that is, highly oxidizing. With the formation of the slag-metal emulsion, the iron oxide reacts with the carbon present in the bath, primarily outside of the direct oxygen-metal reaction zone, and since such slag-metal reactions are endothermic, the molten bath is maintained cooler in the vicinity of the walls of the refining vessel or converter. For example in the formation of one kg. of FeO, by direct oxidation with the oxygen jet and absorbed as iron silicate into the slag, 80 kg. calories of heat are developed. An equal amount of heat is absorbed outside of the confined central zone of direct oxidation as the FeO (as silicate) is reduced by the carbon in the bath, as one example of slag metal reactions occurring during the blowing." (Col. 5, lines 60-75, Col. 6, lines 1-4). (Emphasis added).

In the next two columns the patent states that "formation of an early highly oxidizing fluid slag is of particular value in basic refining when the process applied to pig iron of analyses used in ordinary open-hearth practice, which would not be amenable to refining by either the acid Bessemer process due to the phosphorus content, or the basic Thomas process due to the lack of sufficient phosphorus." (Col. 6, lines 5-11). Thereupon instructions and explanations are given for the addition of lime, or lime supplying substances in the treating of "normal open-hearth pig irons" having **[48]** specific phosphorus or sulfur contents with some attention to the manganese contents. (Col. 6, lines 11-51). The next paragraph instructs upon the purity of the oxygen to be used. (Col. 6, lines 52-61).

The patentees further discuss the chemical reactions as they abate when oxidizable matter is exhausted, and the oxygen jet becomes effectually impotent.

They state:

> "The vigorous boil, above mentioned, continues up to the carbon end point, and together with the induced circulation of the bath metal toward and away from the central zone of direct oxygen reaction, effectively counteracts any tendency to overoxidation of the bath. When the flame dies and carbon combustion is completed, the bath becomes relatively quiet and intimate contact between slag and metal bath ceases. The turbu-

lence of the bath and slag due to the oxygen stream impinging from directly above is insufficient to cause continuance of oxygen-metal reactions." (Col. 6, lines 62-72).

This is followed by an explanation on the oxygen content of the finished steel according to certain percentages and this statement:

> "Thus, the oxygen content of steels produced by the high purity oxygen blowing process *compare very favorably with oxygen contents of basic open-hearth steel* in the same carbon range, and are definitely lower in oxygen content than bottom blown Bessemer steels using air, oxygen enriched air, oxygen and steam, or other gas mixture." (Col. 7, lines 2-8). (Emphasis added).

The next paragraph deals with silicon, and the fact that pig irons with higher silicon are actually advantageous in this method of steel blowing:

> "As in the basic Bessemer process, the silicon is rapidly eliminated. However, in contrast **[49]** to the basic Bessemer process, the use of high silicon charges presents no problem due to the fact that slopping is not encountered in the process of the invention to any degree similar to that in the bottom blown Bessemer practice. In fact, higher silicon pig irons actually are advantageous in the high purity oxygen blowing due to the heat producing effect of this element in the early stages of the blow with the result that higher scrap charges can be made in the process." (Col. 7, lines 9-18).

The patent instructs on the quantity of scrap additions which may be used depending upon the silicon content of the pig iron. (Col. 7, lines 19-26). Thereafter, "the manganese content of the fully blown metal and of the slag" is discussed as well as chemistry in relation to carbon and without the addition of more manganese. It is stated, "Nevertheless, it is evident that due to the extremely high temperatures developed in this high purity oxygen process, a manganese recovery is possible which cannot be reproduced in known processes." (Col. 8, lines 15-19). Examples of three heats are given with the variable compositions of pig iron (without ferromanganese or deoxidizer). And thereupon, this statement is made:

> "From the foregoing test, it may be seen that manganese recovery at least 10 times as high as the final carbon content in the finished steel is obtainable by the process of the invention utilizing pig iron having manganese on the order of 3%." (Col. 9, lines 35-39).

The next paragraph concerns iron recovery economy and is summed up in the statement that,

> "With mechanical losses averaging about 0.8%, the percentage recovery of the refining process is approximately 90%, *comparable to the yield* **[50]** *obtainable by the basic open-hearth process.*" (Col. 8, lines 43-46). (Emphasis added).

The percentage changes of the FeO in the slag as the blow continues is explained (Col. 8, lines 40-60).

The patent proceeds to explain the oxygen requirement and particularly as it "insures satisfactory rereduction of FeO from the slag, in the manner set forth above." Exemplification is provided in that "refining to usual carbon end points on the order of 0.05% C is completed in from about 15 to about 30 minutes, preferably 18 to 22 minutes." (Col. 8, lines 61-75, Col. 9, lines 1-3).

The next two paragraphs discuss blowing. In the first paragraph there is set forth "exemplary commercial practice with 30 ton converters charged to 35 to 36 tons, oxygen pressures at the blast nozzle of about 8 to 10 atmospheres and oxygen jet or blast nozzle diameters of from about 27.5 to 35 millimeters (1.1 to 1.4 inches) with nozzle spacings varying from 25 to 50 inches (about 650 to 1250 millimeters have been used, the preferred spacing being from 30 to

40 inches (about 750 to 1000 millimeters)." (Col. 9, lines 6-13). It concludes:

> "In general, it may be stated that as the oxygen pressure and nozzle diameter are increased, the nozzle spacing is also increased, for example, as the capacity of the refining vessel and total charge is increased. Under these conditions, deep penetration of the molten metal bath is avoided, while the necessary displacement of the slag cover to maintain direct oxygen to molten metal contact is insured. However, in the unusual circumstances of an abnormally stiff slag cover, the blow may be initiated using mechanical means for penetrating the slag cover to establish oxygen to metal contact." (Col. 9, lines 13-24).

[51] With this kind of blowing under certain circumstances the rate of oxygen input may be reduced in the last few minutes of the blow, and this supports "the inherent characteristic of the process in regard to avoidance of over-oxidation of the heat." Accordingly, "it is generally unnecessary to utilize any deoxidizing agents such as ferromanganese and ferrosilicon in the production of semi killed steels, and only in the production of killed steels are the conventional deoxidizers employed." (Col. 9, lines 25-37). It is taught that one of the process's major advantages is its applicability to pig iron of analyses used in ordinary open-hearth practice which are not amenable to refining by either the acid Bessemer or basic Thomas process. Additionally, the process is applicable to pig iron having analyses of the type which are normally used in either the acid Bessemer or basic Thomas processes. Illustrations are thereafter given. (Col. 9, lines 38-69). A description is given for an exemplary method of carrying out the present invention. (Col. 9, lines 70-75, Col. 10, lines 1-14). Further information is given on the character of the converter for the "preferred commercial practice of the invention" (Col. 10, lines 15-22). After all of these explanations and instructions an example is set forth (Col. 10, lines 29-75).

That the process provides for variable uses is set forth in Col. 11.

Following all these explanations and instructions the patentees make two claims. In light of the current law and the prior proceedings, the claims represent the hub of the **[52]** controversy in the case. Accordingly, I reproduce these here *in toto*:

> "We claim:
>
> 1. Method of refining molten impure iron in the presence of a slag in a vessel having a refractory lining by blowing with oxygen, which comprises discharging a stream of oxygen vertically downwardly through the slag layer onto and below the surface of the bath at the central portion thereof, *to an extent to avoid material agitation of the bath by the oxygen stream,* the contact of the oxygen with the bath resulting in reaction of the oxygen with a portion of the iron and with the oxidizable impurities of the bath *in a localized reaction* zone spaced a substantial distance from the refractory lining, the reactions in said zone resulting in refining of the iron and gas evolution and in the production of high temperature in the reaction zone away from the refractory lining, said reaction producing a circulatory movement in the molten metal, which circulatory movement brings those portions of the molten metal bath which are remote from the reaction zone into the reaction zone whereby those portions are subjected to said reaction with minimum injury to the refractory lining.
>
> 2. The gaseous oxygen process set forth in claim 1 in which the oxygen is blown into said vessel under pressure in a range between about five and about twenty-five atmospheres above normal atmospheric pressure." (Emphasis added) (Col. 12, lines 9-33).

The *McLouth* plaintiffs asserted that there existed a chemically induced down in center circulation as a part of the process, but that the *McLouth* defendant's contended that this circulation was not set forth in the claims. The patent specification leaves little doubt that the patentees

disclosed that a circulation was created and existed by reason of the process. I recognize that there is no definitive statement in the specification of the exact direction of circulation. In one place, however, the specification does refer to the ensuing reaction of the carbon with the FeO which results in the **[53]** formation of carbon monoxide, which in turn, "causes a strong boil or agitation of the bath, which augments the bath circulation to continuously present unrefined metal to the oxygen gas reaction zone and to create a slag-metal emulsion" (Col. 4, lines 60-67).

For the present we only keep these matters in mind so that we may better understand the issues as they arise in this regard.

Thus, the prior workers, including Schwarz, Durrer and Miles, struck upon the ideas that better contact was obtained by the stirring action if the jet of oxygenated air or liquid was not injected from the bottom or at the sides of the bath as practiced in the Bessemer and Thomas process, but rather from the top onto the surface and into the bath. They also found that rapid conversion occurred. These inventors, however, faced two critical drawbacks for practical operation: they could not control the quality of steel obtained, and they could not prevent the destruction of the refractories or lining of the vessels.

The instant patent makes clear the fact that it is a double reaction which takes place: first, in the confined zone of the oxygen jet impingement at the surface area where the heat of the process is *generated* (Col. 4, lines 43-75; Col. 5, lines 1-5; Col. 6, lines 62-72); and second, in the area surrounding this where the heat is *absorbed* by another character of **[54]** chemical reaction. (Col. 4, lines 43-75; Col. 5, lines 1-5; Col. 6, lines 62-72).

The information which we derive from the patent specification is that after the oxygen to metal impingement is made, the ensuing reactions flow from the natural laws

of chemistry. Thus, all that the steelman need do is provide the instructed elements to produce the chemical action and reaction which occurs upon the impingement of the oxygen jet on the metal surface.

Summary of Schwarz, Miles and Suess

From the study of these three patents, we now see the difference of the Suess et al. theory from that of Schwarz and Miles. In Schwarz and Miles a stream of oxygen, oxygen enriched air, liquid (as in the case of Miles), or pulverulents is injected within the bath to provide a stirring or agitation effect for the purpose of procuring "intimate contact" of the oxygen within the interior of the bath. The theory of Suess was to provide only oxygen to metal surface contact impingement producing a hot center surface reaction area. This area, in turn, was surrounded by or imbedded within, the cooler, heat absorbing remainder of the bath.

From my study of the process, I have learned that the Suess process separated the prior art processes of Schwarz and Miles into two phases. Where the prior art contained the entire chemical reaction within the interior of the bath, Suess **[55]** instructions provided for two different but interrelated chemical phases. One of these described in chemistry as "exothermic,"[9] and is characterized by or formed with evolution of heat. The second reaction, "endothermic,"[10] is characterized by or proceeds with absorption of heat.[11]

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[9] Webster's Third International Dictionary, Unabridged, 1971 at page 798.

[10] (Id. at page 750).

[11] Although I have discussed the technical aspects of these two chemical reactions, I can here, for a faster understanding of these, illustrate by the boiling of water on the kitchen range. The gas flame of the burner represents the exothermic chemistry by reason of the fact that the gas (hydrogen) is being burned (oxidized) and

By its process the Suess Patent teaches controlled mechanical vertical impingement of the jet at the central surface of the molten bath, and thus causes the chemical reaction to proceed unimpeded. By such teachings it alleges it avoids deep penetration (taught by Schwarz and Miles) and material agitation (taught by Miles).

The questions presented in these actions and previously in the *McLouth* action would never have accrued had Schwarz, Miles or the men at Gerlafingen presented a practicable, utilizable process to industry.

[56] II. The Sua Sponte Issue

The *sua sponte* issue was raised here by the plaintiffs based on the *McLouth* District Court holding that "... the applicants *abandoned* the use of language referring to the avoidance of deep penetration and later chose to submit the language of the claims as finally approved by the Patent Office, resulting in the issuance of the patent in suit. Therefore, the well-established doctrine of file wrapper estoppel prohibits a construction of the claims finally approved by the Patent Office as containing a concept expressed in language previously rejected by the Patent Office and then *abandoned* by the applicants." (257 F. Supp. at page 427) (Emphasis supplied).

This finding was arrived at after the District Court had found that the original "Claims 1 through 4 of the continuation-in-part application, which expressly mentioned the avoidance of deep penetration as an essential feature of the claimed invention, were rejected by the Patent Office and later cancelled by the applicants." (257 F.Supp. at page 426).

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this reaction creates heat. The water in the kitchen kettle or pot will eventually approach the boiling point because it is absorbing the heat created by the burning gas—and this represents the endothermic or heat consuming chemistry.

The *McLouth* District Court expressed its opinion that the applicants should have pressed the claims in the Patent Office because it was convinced "on the state of this record that the 'new mental concept' of the patentees to avoid a deep penetration **[57]** of the bath by the jet was a patentable advance in the art of steelmaking, which explains the adoption of the Linz oxygen steelmaking process by steelmakers throughout the world." (257 F.Supp. at page 427).

The plaintiffs and defendant here stipulated that this determination was made by the District Court *sua sponte* without an opportunity on the part of plaintiffs to present rebuttal evidence. The plaintiffs here alleged that they had convincing evidence that would prove that there was no act of abandonment. Accordingly I permitted further hearings on that issue.[12]

The issues thus raised present an estoppel within an estoppel question:[13] Since the *McLouth* District Court raised the file wrapper estoppel issue *sua sponte,* are the plaintiffs here barred from further action on the basis of the doctrine of collateral estoppel? The estoppel question for me at the present time has now become a two-pronged inquiry: first, as it relates to the evidence presented by the plaintiffs here before me on the **[58]** question of whether or not the *McLouth* District Court properly invoked the file wrapper estoppel; and second, whether or not the plaintiffs, without any fault of their own, were deprived of the right to present evidence on the file wrapper issue so as not to be collaterally estopped under *Blonder-Tongue.*

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[12] It should be noted that this occurred prior to the *Blonder-Tongue* decision. See File Wrapper Estoppel record.

[13] That is, I must first dispose of the issue of file wrapper estoppel before an ultimate determination can be made on the issue of collateral estoppel.

The First Post Trial Hearing on File Wrapper

The issue raised by the plaintiffs that the District Court should not have made the file wrapper estoppel determination, *sua sponte,* was raised before me after the proceedings had been completed at Detroit. Additional evidence was presented here on April 29, 1970 relating to what transpired at a meeting in the Patent Office on May 1, 1957, when the Suess patent was under consideration.

At the April 29, 1970 hearing, the plaintiffs presented one witness and one deposition. The deposition was that of Claude A. LeRoy who was the Primary Examiner in Division Three of the Patent Office when the Suess et al. application was under consideration and who finally approved the wording in the claim, allowing the patent to issue. In his deposition (PX-1002) LeRoy testified that the policy of the Patent Office was to avoid the use of negative language in all claims to the extent such was possible (PX-1002, page 7, 11); that the concept of deep penetration was well understood in the art, but he believed **[59]** it would be more appropriate to emphasize the inventive feature of a localized penetration; and that he felt that the phraseology that the oxygen jet be blown to an extent "to avoid material agitation" of the bath by the oxygen stream was a more positive expression of the concept. He stated: (PX-1002, at pages 8, 9, 10):

> ". . . I thought that the language should try to bring out that the oxygen stream was confined or localized in the area somewhere near the surface of the bath. The deep language, the deep penetration, I thought, was well known in the art. It is a special penetration into the bath, but if you wanted to define this as being localized, I didn't like the language of 'avoid deep penetration.' So, I suggested that they use something to show it was localized in that area . . ."

He continued:

> ". . . we had considerable discussion as to the positive manner in which they would define that feature of having the penetration extended down into the bath, just a rather insubstantial distance as far as the prior art was concerned. It was well understood in the art that deep penetration meant a considerable distance into the bath and they wanted to avoid that concept; so I tried to bring their—bring to their cognizance that it was a localized penetration and so the language that we finally adopted there was to bring out that feature."

The witness who testified here, at the first post-trial hearing, was Byron T. Gardner, Esq., who represented the **[60]** applicants at the May 1, 1957 meeting. He testified that the prior art and especially the Miles patent were discussed; that the Suess et al. process directs "the stream of oxygen in a much gentler fashion onto the surface of the bath through the slag on top of the bath and in such a manner as to create a localized area of intense heat and reaction . . . so the process was autogenous . . ." (FWE pp. 18-19); that "the agitation turbulence which characterized the Miles process was avoided" (FWE p. 19); that "the outer portion of the molten charge, instead of being hot, very hot, as in the case of the Miles operation, was relatively cooler than the reaction zone so that there was no erosion or little erosion as compared with the Miles process in the converter lining or walls" (FWE p. 19); that the choice of words "was a matter of definiteness, really. The scope so far as we were concerned, was not changed at all. We weren't giving up anything, didn't intend to give up anything." (FWE p. 24); that the distinction was one of language rather than substance (FWE p. 24); that the Miles patent contains the language "the jet serves to maintain vigorous agitation" (FWE p. 25); that the primary examiner **[61]** felt and said that "without material agitation" was a "more definite limitation, better defined the invention than 'avoidance of deep penetration' or 'without deep penetration'" (FWE p. 25); that he took this to be a distinction between the Miles patent and the one which was being presented (FWE p. 25); that the Schwarz patent was also discussed and

that the latter patent teaches that the penetration of the jet should be "deep, like a rod" (FWE p. 26); that there was no discussion of any limitation or abandonment; and, that the phrase " 'without material agitation' grew out of the fact that there was definitely an equivalency between low blowing rate and agitation and a high blowing or high velocity rate and deep penetration and agitation" (FWE p. 22) as the Examiner felt and as counsel agreed.

The defendant elected not to present evidence at the hearing on file wrapper estoppel.

Counsel for the plaintiffs argued that the lack of motive or opportunity to present evidence of what had occurred in the Patent Office was not a matter which could properly be raised in the *McLouth* appeal since an appellate court focuses almost exclusively on matters of law not fact. Thus, because **[62]** the plaintiffs erroneously believed that they would prevail on appeal as a matter of law, and because of the existence of the *Triplett* doctrine affording a plaintiff additional opportunities to re-litigate the factual merits of the patent, no attempt was made to reopen the Detroit record after the *McLouth* District Court filed its Opinion. Furthermore, it was indicated that an effort to reopen a record after the final merits disposition had been made, would have been an extremely unusual practice. (CE pp. 61-63).

The Blonder Tongue Post Trial Hearing

With the Supreme Court's rulings in *Blonder-Tongue* and after the defendant amended its answer to raise the question of collateral estoppel, a second post-trial hearing was held on September 7, 8 and 9, 1971. The evidence of the Primary Examiner and of the attorney for the applicants introduced at the first post-trial hearing was stressed, and additional evidence was adduced by the plaintiffs on file wrapper estoppel, and secondly on the issues raised under *Blonder-Tongue*.

On the question of file wrapper estoppel, the witnesses were David L. Ladd, lawyer and former commissioner of patents from 1961 to 1963; William E. Schuyler, Jr., a patent lawyer **[63]** and a former commissioner of patents from 1969 to 1971 and Robert B. Larson, a patent attorney and a former President of the American Patent Law Association in 1960-1961 and following that Chairman of the National Council of Patent Law Associations. On the question of collateral estoppel, Dr. John F. Elliott, Professor of Metallurgy of the Massachusetts Institute of Technology, who had testified as an expert at the *McLouth* trial, attempted to demonstrate the lack of technical understanding of the *McLouth* Courts.

The first witness, Mr. Ladd, testified that the Rinesch and Hauttmann affidavits (PX-2A) were included in the file history and would not have been obvious to anyone until the patent was issued, because until that time the entire contents of a file are unavailable to the public; but that upon issue, the entire file wrapper becomes public and nothing could possibly be obscured in the file (CE pp. 60-62), even though such an obscurity was determined to exist by both the *McLouth* District Court (257 F. 2d at 431) and the *McLouth* Court Court of Appeals (400 F. 2d at 50), or even seven years later as suggested by the District Court. He testified further that the **[64]** examiner in the Patent Office ordinarily consults the specification and the file wrapper in order to precisely ascertain the meaning of particular terms (CE pp. 70-71); that the Schwarz patent was voluntarily brought to the attention of the Patent Office (CE p. 89); that cancellation of a phrase and substitution of another is not an abandonment of the original concept (CE p. 113); and that the record disclosed that "the Examiner was aware of and applied the statutory provision of definiteness" (CE p. 156).

The testimony of William E. Schuyler, Jr., the Commissioner of Patents during a term from 1969 through 1971,

was in a large measure cumulative of Mr. Ladd's testimony. He did testify, however, that the final claims did not constitute an abandonment of the earlier language, but rather represented a more precise statement of the claims (CE p. 186); that Claim No. 16 which spoke of avoiding deep penetration was still pending when the new claims and affidavits were filed (CE p. 188); that the final terms of a patent are gradually arrived at through a give and take negotiation process between the examiner and the applicant (CE p. 189); that a failure to list Schwarz in the reference cited at the end of the patent, was not indicative of failure by the examiner to consider the Schwarz patent (CE p. 192); **[65]** that a change in the language of a claim does not constitute an abandonment of the concept (CE p. 205); that "Abandonment of language and abandonment of concept are two different things," and that in his expert opinion the applicants changed the language but not the concept (CE p. 231).

Robert B. Larson, patent attorney and President of the American Council of Patent Law Associations during 1960-1961, testified that in construing and interpreting a patent it is necessary to consider its entire file wrapper history (CE pp. 303-305); that when claims are rewritten an abandonment does not necessarily occur; that "The mere rewriting of a claim with the use of different phraseology in and of itself certainly does not constitute an abandonment of what was previously claimed" (CE p. 307); that where the file wrapper under certain circumstances indicates an abandonment, that would be different, "But mere language is not" (CE p. 307).

When asked:

> "Q. Where new claims however are submitted after the cancellation of the claims and there is nothing in the file history to indicate an intent to abandon, do the cancelled claims and the submitted new claims give rise to this matter of abandonment?
>
> A. Oh, no, certainly not." (CE pp. 307-308)

[66] Mr. Larson testified that at the time the patentees canceled their original claims Nos. 1 through 4, they substituted Claim No. 12 which spoke of avoiding deep penetration. This showed the continuity of the concept and lack of any attempt to abandon it (CE pp. 317-318). At the time the supplemental amendment was filed on June 11, 1957, Claims 15 and 16 were still in the application. Then the prior claims were canceled and new claims 17 and 18 substituted therefor (CE pp. 319-320). By the amendment filed on June 11, 1957, the language of Claim 17 was changed to avoid the negative limitations (CE p. 325); and since new matter cannot be introduced in an application by means of amendment, it can be assumed that the amended claims did not in the view of the examiner introduce any new matter (CE p. 330).

I have reflected critically upon this evidence. I have skeptically questioned how the terminology "to such an extent as to avoid material agitation" is more positive than the phrase "without deep penetration." However, I would accept the uncontradicted testimony of the Primary Examiner, Mr. LeRoy, that "deep penetration" "was well known in the art" (PX-1002 p. 8). I also find that Suess et al. taught "a **[67]** localized penetration, and so the language that we finally adopted there was to bring out that feature." (PX-1002 p. 10). This the Primary Examiner evidently believed. Furthermore, in accordance with what the attorney for the applicants stated, these words expressed the differentiation of the "agitation" produced by the stirring action of the jet in Miles, from its lack of stirring in Suess.

All of this was evidently a matter of the negotiation of wording between the applicants and the Patent Office. But the concept of blowing as expressed in the specification and as it had been expressed in the many claims which had

previously been filed was not altered in substance. This was positive, undisputed evidence which came from former Patent Office representatives, those who negotiated with them, and patent law experts. It remains uncontradicted before me.

I also feel that the words "deep penetration" have been so overemphasized as to have acquired an unwarranted significance. In the constant reference by plaintiffs' counsel to the difference between the old art and the Suess patent, these words were used almost constantly, and even to such excess as, I can speculate, may have induced the *McLouth* District Court into [68] believing that the old Schwarz-Miles gist of invention was the deep penetration, whereas the gist of the Suess invention was the avoidance of deep penetration, and accordingly believing that this phraseology should have been included in the claims which ultimately were presented and allowed in the Patent Office.

Examiner LeRoy recognized this as an inappropriate, perhaps even an unnecessary, emphasis which the applicants had been making in contrasting the prior art from the instant patent when he said everyone knew that the prior art used deep penetration. (PX-1002 pp. 8, 9, 23). What LeRoy sought was to make those skilled in the art of steelmaking aware of a process creating a localized reaction zone at the surface of the bath. According to the thinking of this expert in the Patent Office, avoidance of deep penetration was not the "gist" of the invention; the localized reaction zone created under limited conditions at the surface of the bath was its essence. Accordingly he desired that the claims signify that there be no interference physically with the chemical action set up locally at the surface of the bath.

This novel concept was contained in the initial application, preserved in the continuation-in-part application, [69] and evolved as the consistent language in the final claims. It is accordingly obvious that throughout the course of this

patent prosecution from the time of filing of the original application on January 16, 1951, through the issuance of the patent on July 23, 1957, the recurrent theme appears of controlling bath ratio, oxygen pressure, and lance height to vertically create the hot spot in a localized zone of reaction in the central surface of the bath removed from the refractory walls, with the distinguishing cautionary phrases of avoiding deep penetration or material agitation by the oxygen stream, as those phrases might be understood by persons skilled in the art of steelmaking. Such practice protects the refractory, and invariably produces high quality steel.

As for the claims, although these do not seemingly mention the two phases of the chemistry described in the specification, that is the autogenetic and endothermic, it does generally describe the creating of the "localized reaction zone", as the words used therein explain that the oxygen is to be discharged in accordance with Claim 2 as projecting the words in Claim 1 "to an extent to avoid material agitation of the bath by the oxygen stream . . . resulting in reaction of the oxygen with a portion of the iron and with the oxidizable impurities . . . in a localized reaction zone. . ." and the circulation thereafter in the bath. To a person expert in the art of steelmaking, the words are such as to caution him to avoid the use of the oxygen stream so as not to disturb the localized reaction zone. Thus, in addition to the caution to avoid the stirring of the bath as done in prior art, there is the significance to the steelmaker that the discharge of oxygen must avoid any material agitation which would interefere with the creation and maintenance of autogenous (exothermic) localized reaction zone, so that the chemistry involved might function both autogenetically and endothermically.

I have already set forth in considerable detail here the file wrapper history and the wording of the claims as this wording evolved into a finalization between the Patent

Office and the patentees. But was this negotiation legally permissible so as to foreclose a file wrapper estoppel?

Generally, when one acquieses in the rejection of a claim and accordingly modifies it, he may not later expand his claim by interpretation to include principles originally rejected or their equivalents. *Schriber-Schroth Co.* v. *Cleveland Trust Co.,* [70] supra; *Trio Process Corporation* v. *L. Goldstein's Sons, Inc., supra; Ellipse Corp.* v. *Ford Motor Co.,* 452 F. 2d 163, C.A. 7, 1971. Stated differently, the doctrine of file wrapper estoppel results when a patentee who has acceded to rejection of his original claim *as lacking invention,* amends his claims to show a definitive characteristic distinguishing his device. He cannot then claim patentable novelty in any other disclosure of original patent or re-issue based upon it. *AMP Incorporated* v. *Burndy Corporation,* 332 F. 2d 236, C.A. 3, 1964., Cert.den. 379 U.S. 884 (1965).

However, the rule is not applicable where a patentee has not abandoned any element of his combination to meet any objections of the patent office examiner; *Toy Ideas, Inc. and American Character Doll Corp.* v. *Montgomery Ward & Co. Inc.,* 172 F.Supp. 878 (D.C.Md.,1959); or where the patentee encounters difficulty in the Patent Office because of particular wording and indefiniteness of the claims; *Eimco Corp.* v. *Peterson Filters & Engineering Co.* 406 F. 2d 431, C.A.10, 1968; Cert.den. 395 U.S. 963 (1969) or where an applicant for a patent does not surrender his broad claim in making the amendment of the application and the Patent Office does not make the amendment a condition of the grant; *Priebe & Sons Co.* v. *Hunt et al.,* 188 F. 2d 880, C. A. 8, 1951; or where the objections in the Patent Office do not result from prior art similarities. In *Toy Ideas, supra,* (at page 883) [71] where the examiner's objections to 11 claims were that they were "indefinite," new claims were filed to meet these objections, and file wrapper estoppel was held not to apply.

The evidence in the first hearing before me on file wrapper estoppel was that it is a normal procedure in the Patent Office for the examiners and the patent attorneys to negotiate on words of a claim. In this case the purpose of the discussion was to emphasize the *difference* between the instant patent and the prior art. There is considerable authority for such practice. *Eimco Corp.* v. *Peterson Filters & Engineering Co., et al., supra; Priebe & Sons Co.* v. *Hunt, supra; Bishman Manufacturing Co.* v. *Stewart-Warner Corp.,* 380 F. 2d 336, 339, C. A. 7, 1967, Cert. den. 389 U.S. 887 (1968); *L.S. Donaldson Company* v. *LaMaur, Inc.,* 299 F. 2d 412, C. A. 8, 1962.

It is important to note that the Patent Examiner, when he sought a positive rather than a negative assertion, was not concerned with any similarity between the instant patent application and the prior art, but rather with the difference of phraseology which described the theory from that of the prior art. Concerning similarity, Chief Judge Murrah in *Sears, Rosebuck Co.* v. *Jones,* 308 F. 2d 705, C. A. 10, 1962, Cert. den. 351 U.S. 972 (1951) at page 708 said:

> [72] "In these cases, however, the patentee limited his claim to a specific structural detail in view of the disclosures of prior art; argued and represented that the structural detail defined in his claims constituted the distinguishing feature of his patent over prior art; and issued his patent only with claims limited to such structural detail, thus acquiescing in the Patent Office rejections based on prior art disclosure. Jones' difficulty with the Patent Office did not result from any prior art similarities which had to be resolved by the limitation of his inventive claims to structural differences. Rather, Jones' attorneys had difficulty in wording claims acceptable to the Patent Office and the rejection of claims was based on 'indefiniteness.' The claims in suit solved Jones' problem of 'indefiniteness' and since Jones did not by representation or acquiescence, limit his patent to the specific structure of a release lever pivoted on the movable handle, we find no estoppel."

While in the *McLouth* case, as well as in these *J & L* cases, considerable emphasis was placed on the meaning of the words "deep penetration" and "material agitation", we are reminded what Judge Durfee said in *Autogiro Company of America* v. *United States,* 384 F. 2d 391 (Ct. Cl., 1967), at page 396:

> "The very nature of words would make a clear and unambiguous claim a rare occurrence. Writing on statutory interpretation, Justice Frankfurter commented on the inexactitute of words:
>
> > They are symbols of meaning. But unlike mathematical symbols, the phrasing of a document, especially a complicated enactment, seldom attains more than approximate precision. If individual words are inexact [73] symbols, with shifting variables, their configuration can hardly achieve invariant meaning or assured definiteness.
>
> Frankfurter, Some Reflections on the Reading of Statutes, 47 Col. L. Rev. 527, 528 (1947). See, also, A Re-Evaluation of the Use of Legislative History in the Federal Courts, 52 Col. L. Rev. 125 (1952)."

On April 29, 1970 at the first post-trial hearing the defendant raised an objection that this testimony was immaterial and that it violated the Parol Evidence Rule. I considered that even if the patent was a contract, the evidence here is merely explanatory of what occurred while the contract was being formulated.

The contractual nature of a patent is well documented in the federal judiciary, *Goodyear Dental Vulcanite Co.* v. *Davis* 102 U.S. 222 (1880); *Texas Co.* v. *Anderson-Prichard Refining Corp.,* 122 F.2d 829, C.A. 10, 1941. Recognition of this status had inevitably involved simultaneous acceptance of the well-known contract rule that patrol, or outside, evidence may be received to interpret the patent (or contract), but not to enlarge, diminish or vary the language, *Goodyear Dental Vulcanite Co.* v. *Davis, supra,* at page

227; *Van Der Horst Corp.* v. *Chromium Corp.,* 98 F. Supp. 412, 420 (S.D.N.Y. 1951).

Though I have also considered the possible conflict between Patent Office Rule 1.2 and my allowance of evidence concerning patentees' negotiations with the Patent Office examiners, and although they were not recorded verbatim in the file wrapper, the negotiations were referred to there (PX2A, at page 74). As was stated in *Lavell Aircraft Corp.* v. *United States,* 358 F.2d 1005, 1007-1008 (Ct.Cl. 1966): "For purposes of determining whether or not an accused structure infringes a claim, the claim *must* be interpreted not only in light of the specification but *also with reference to the statements made to secure the allowance of patent claims.*" (citing cases) (Emphasis added).

Avoidance of Deep Penetration Within the Specifications

I have reviewed the various references by the *McLouth* District Court related to patent terminology and particularly to reasons why it seemed to strike upon a finding that "avoidance of deep penetration was the *gist* of the invention." This is extremely critical because this conclusion was adopted by the Court of Appeals. However, consideration of its meaning must be from the viewpoint of both the experts skilled in the art of steelmaking and of a lawyer or judge called upon to give it meaning or significance.

From the very beginning I had the conviction the *McLouth* District Court's statement meant that "avoidance of deep penetration" was the *sine qua non* of the invention. Assuming then that "avoidance of deep penetration is the invention," it would seem sufficient for anyone skilled in the art of steelmaking to be able to make steel of open-hearth quality without any further instructions.

[74] Throughout the *McLouth* record the District Court's conclusion, that the concept of "avoidance of deep penetration is the gist of the invention," places emphasis on

this one aspect which as the District Court said, was recited four times in the patent specification.

It is obvious here that if the specification had attempted to teach one skilled in the art of steelmaking only "avoidance of deep penetration" without any other instructions, it would have taught him no process at all. Why would the patent have prescribed detailed instructions on character of vessel, size of nozzle, pressure and height of nozzle, vertical and central placement of nozzle, and ratio of bath depth to surface area and the reasons therefor, if "avoidance of deep penetration" was the invention?

We observe that throughout the entire prosecution, as reflected in the file wrapper history, the specification remains virtually undisturbed and unchanged. Even in the claims, which went through a refinement process, "avoidance of deep penetration" had been referred to as an afterthought. In other words, both the specification and the claims *ab initio* gave the impression that deep penetration was an unwanted circumstance; and it was evidently this caution which the principal examiner sought to [75] have the applicants reflect in more positive language. The testimony of LeRoy and Gardner was supported by the file wrapper history where in the remarks appended to the June 17th amendment it is stated that Claim 17 (which became the approved Claim 1) "is made in view of the conference with the Primary Examiner on June 14, 1957 in order to improve the definiteness of the claim and to eliminate the negative limitation present therein." (PX2A, p. 98).

Depth of penetration is a function of nozzle pressure and nozzle height from the bath. The District Court was impressed by these two factors as they were shown by the experimentation of Suess on June 25, 1949. Control of nozzle pressure and nozzle height, however, are just two facets of the many overall instructions of the Suess patent. If we were concerned with these two phases, and these alone,

"deep penetration" or "avoidance of deep penetration", would be the subject matter and required to be stated in the claims. But since the patent teaches pressures, capacious contents, vertical or approximately vertical, central nozzle placement and ratio of depth to surface area—these also become vital factors; and while they all bear a definite contributing combination-relationship to "avoidance [76] of deep penetration", these additional factors are so essential in other respects as to make the process impossible without the attainment of all of them.

For example, if the nozzle is placed at various angles such as permitted by Schwarz, Miles, Durrer and Hellbruegge, then in actuality there would not be practical oxygen impingement on the bath surface. The oxygen jet would strike angularly at part of the bath and produce refractory harm to the opposite side. If the nozzle were placed off center so that it was closer to the one refractory wall, it would destroy that refractory. If there was a disregard of ratio of depth to surface area, a shallow bath or a too narrow surface would provide unwanted intimacy between the oxygen and bottom or side wall refractory.

As one reads the entire phraseology of the specification, specifically the four places where references are made of "avoidance of deep penetration", with their accompanying and surrounding language, one recognizes that the conclusions of the District Court did not reflect the thinking and teaching of the patentees. Accordingly, I set forth the particular phraseology of the four references in their context as they appear in [77] various places of the specification:

(1) "According to the process of the invention, the high purity oxygen jet is blown vertically, or approximately vertically, upon the central portion of the surface of a bath of the molten metal, the jet having a diameter and static pressure at the point of origin, that is, at the blast nozzle or other jet producing means, and the point of origin (blast nozzle being spaced from the bath surface, such

that direct contact of the oxygen jet and the molten metal *is established and maintained* throughout the refining period *without deep penetration of the molten metal bath by the jet.*" (Emphasis added). (Col. 3, 36-47).

(2) ". . . produces a sufficiently high reaction velocity of the oxygen with the bath constituents to insure the development of autogenous heat at a rate sufficient to provide the heat required for completion of the refining in a minimum of time, consistent with controlled temperature and control and development of other necessary and required process conditions, such as fluid slag, *avoidance of over-oxidation* (undue loss of iron to the slag), and *avoidance of slopping. The process conducted under these conditions avoids a deep penetration of the oxygen gas into the molten bath. . .*" (Emphasis added). (Col. 3, lines 64-75).

(3) "The ensuing reaction of carbon with the FeO and directly with the oxygen gas in the confined direct oxidation zone causes rapid formation of carbon monoxide and the formation of this CO causes a strong boil or agitation of the bath, which augments the bath circulation to continuously present unrefined metal to the oxygen gas reaction zone and to create a slag-metal emulsion. The oxygen jet thus contacts the emulsion of bath [78] and slag components which presents a larger reaction surface and causes the refining reactions to progress rapidly *although the oxygen jet does not penetrate deeply into the molten metal bath and is confined to an impingement area at the central portion of the bath surface.*" (Emphasis added). (Col. 4, lines 60-72)..

(4) "In general, it may be stated, that as the oxygen pressure and nozzle diameter are increased, the nozzle spacing is also increased, for example, as the capacity of the refining vessel and total charge is increased. *Under these conditions, deep penetration of the molten metal bath is avoided,* while the necessary displacement of the slag cover to maintain direct oxygen to molten metal contact is insured." (Emphasis added). (Col. 9, lines 13-20).

As is obvious, these four references in the specification, as cited for authority by the *McLouth* District Court that "avoidance of deep penetration is the gist of the invention" do not so state. Nor is such a statement contained elsewhere in the specification. Therefore, it is clear that *the specification* does not make "avoidance of deep penetration the gist of the invention."

The statement that the specification does not express any authority on which a finding may be made that avoidance of deep penetration is the gist of the invention is intended only for the limited consideration of the question of file wrapper [79] estoppel.

I have inquired into the complete file wrapper history in the Patent Office and ascertained why the phraseology of blowing the oxygen stream "to such an extent as to avoid material agitation of the bath" was agreed upon between the primary examiner and the applicants as a substitute for the phraseology "avoidance of deep penetration", and have further considered the law relating to such negotiations. Secondly, I have heretofore examined the specification and its instructions and have arrived at the conclusion that the Suess patent instructs the oxygen to metal contact impingement in such manner that the agitation or stirring of the bath, as in the case of prior art, is avoided; and further, that the language contained in the claim is inclusive of these circumstances. Thus these claims, obtained from the specification itself, add further corroboration to the prima facie status of the patent validity. The foregoing observations lead me to a third avenue of inquiry raised by the plaintiffs under *Blonder-Tongue.*

The plaintiffs assert that they were deprived without any fault of their own of the opportunity to be heard on the issue of file wrapper estoppel as determined by the *McLouth* District [80] Court. This is believable in view of the fact that the defendant did not raise this point as an issue in its pleadings or during the trial of the case. In

all fairness I should perhaps give the plaintiffs the benefit of the doubt despite their failure, knowingly or unknowingly, to act under the circumstances, since under the then prevailing law of *Triplett,* their failure to act on any or all phases of their case did not estop them from raising the point as a new action.

As a matter of equity, due process requires notice and an opportunity to be heard before a person may be deprived of any fundamental rights. That principle has been too well recited in recent times to require authority. That does not mean that a judge does not have the power to raise and decide matters *sua sponte;* it is only to say that when done *sua sponte,* a judge should accord the affected parties some fair notice and the opportunity to be heard on the matter before making any determination. In *Blonder-Tongue* for instance, the Supreme Court exemplified the practice. At page 317 (402 U.S.), it said:

> "We granted certiorari 400 U.S. 864 (1970), and subsequently requested the parties to discuss the following additional issues not raised in the petition for review:
>
> [81] '1. Should the holding of *Triplett* v. *Lowell,* 297 U.S. 638, that a determination of patent invalidity is not res judicata as against the patentee in subsequent litigation against a different defendant, be adhered to?
>
> '2. If not, does the determination of invalidity in the *Winegard* litigation bind the respondents in this case?' "

Our Federal Rules of Procedure further exemplify our belief that a person must have notice and the right to be heard before he may be lawfully burdened by a court of law. For these various reasons and as a matter of equity I am persuaded not to permit foreclosing the rights of the plaintiffs by virtue of the doctrine of this element of collateral estoppel. Though this would have been so before *Blonder-Tongue,* the added estoppel limitations set forth

there make the *sua sponte* decision in the *McLouth* District Court seem more crucial. On the question then of file wrapper estoppel, I hold that the plaintiffs in *McLouth* were deprived, without fault of their own, of a fair opportunity to present evidence on the issue of file wrapper estoppel. Having been granted the opportunity here, the plaintiffs have shown by substantial evidence that there was no abandonment of the Suess et al. practice of avoiding deep penetration and that the defendant in the instant case is not [82] entitled to the defense of the doctrine of file wrapper estoppel here. Further, from this evidence, I find that to one skilled in the art of steelmaking, the concept of avoiding deep penetration is identical to the concept of avoiding material agitation.

[83]

III. Collateral Estoppel—Summary of McLouth Opinions

If there is any authority for me to act here, it must be by virtue of the limited exceptions expressed or reasonably inferred from the *Blonder-Tongue* mandate. It is clear, however, that a district court in subsequent determinations of patent validity must permit proof in certain areas and thereafter make findings thereon:

> "But as so often is the case, no one set of facts, no one collection of words or phrases, will provide an automatic formula for proper rulings on estoppel pleas." (402 U.S. at pages 333-334).

We keep in mind that

> ". . . once the defendant in support of his plea identifies the issue in suit as the identical question finally decided against the patentee or one of his privies in the previous litigation . . ., the patentee-plaintiff must be permitted to demonstrate, if he can, that he did not have 'a fair opportunity procedurally, substantively and evidentially to pursue his claim the first time.' " (402 U.S. at page 333).

We keep in mind, also, that the burden of proof in an estoppel is upon the patentee-plaintiff. Based then on their allegations and the evidence presented at both post-trial hearings before me, I conclude that my entry into the inquiry must be by way of "the opinions filed by the District Court and the reviewing court . . ." (402 U.S. at page 333) in an effort to determine **[84]** whether or not a fundamental lack of understanding occurred. Therefore, a short summary of the relevant opinions is appropriate.

The McLouth District Court determined that the patentees were the inventors of a process which was neither anticipated by the prior art, nor obvious to one skilled in the art of steelmaking. However, the patent was held invalid for the reason that the specification did not support the claims, and the claims did not measure the invention as required by 35 U.S.C. §112.

Specifically, the District Court found that, "Since the avoidance of deep penetration is clearly an indispensable step and indeed the very gist of the invention, its omission from the claims of the patent in suit renders the claims invalid and the patent in suit must, therefore, be held invalid for this reason alone." (257 F. Supp. at page 428).

The District Court reasoned that ". . . when the applicants were faced with the rejection of claims accurately stating what they regarded to be their invention as unpatentable over the prior art, they unwisely abandoned such claims and instead substituted new claims which were accepted by the Patent Office. The new claims failed to point out the actual invention of the **[85]** patentees, and, in addition, certain portions of the claims were not given adequate or meaningful support by the specification." (257 F.Supp. at page 440).

And ultimately, the District Court concluded that "the claims of the patent in suit do not measure the invention of the applicants; they do not accurately define or correctly describe just what the applicants invented; they do not find

adequate support in the specification; and they do not clearly distinguish what is claimed from what went before in the prior art. Therefore, the claims do not meet the requirements of 35 U.S.C. §112, and the patent in suit must be held invalid. 35 U.S.C. §282(3)." (257 F.Supp. at page 441).

The District Court "reluctantly" reached this conclusion because of its earnest belief that the invention disclosed was revolutionary in nature. Nevertheless, ". . . the failure of the claims to focus on or limit themselves to the precise advance in the art by the patentees renders the patent invalid." (257 F.Supp. at page 442). This precise advance, as determined by the District Court, was "the avoidance of deep penetration by the oxygen jet."

The *McLouth* Court of Appeals determined that the claims overclaim the invention and the claims cover the prior art. The **[86]** Appeals Court found that having limited the concept of "avoidance of deep penetration" to practically negligible penetration during the patent prosecution, the patentees could not attempt to incorporate broader limitations. (400 F.2d at page 49).

Additionally, the Court of Appeals held that the patentees had failed to distinguish their depth of penetration from the prior art. Because the Appeals Court believed that the only difference between the Suess process and the prior art arose from an "alleged" differentiation in degree of penetration, this failure was held to be fatal. Specifically, the Appeals Court found that ". . . the patentees failed to define their alleged advance over the prior art and that in failing to properly limit their claims they attempted to extend their monopoly to something already patented. For either reason, or for both reasons, the patent must be held invalid." (400 F.2d at page 51).

Parenthetically, it should be observed a majority of the Court of Appeals held the doctrine of file wrapper estoppel applicable.

These resumes reflect the primary findings contained in the Opinions of the District Court and of the Court of Appeals, with which the plaintiffs find fault.

[87]

IV. Avoidance of Deep Penetration—Claimed or Not

The first inquiry into the *McLouth* findings concerns the conclusion that "avoidance of deep penetration is the gist of the invention" of the Suess patent, and that as a concept it was abandoned in the Patent Office by the acceptance in its place of the phraseology "avoidance of material agitation", which allegedly had no supports in the specification.

The District Court Opinion states that after the litigation had been settled in Austria and Germany over the ownership of the patent rights for the Linz process, a continuation-in-part application was filed in the United States on November 16, 1955, with a more detailed specification and new claims "the first four of which were *directed* to the avoidance of deep penetration of the bath by the oxygen stream as the gist of the invention (PX2A). All the new claims were rejected by the Patent Office on June 14, 1956 as unpatentable over prior art." (257 F. Supp. at page 372, 380-81). (Emphasis added). On December 7, 1956, the first 10 claims were canceled, and the remaining five claims were resubmitted along with a new one. The pending six claims were canceled by the applicants "without waiting for Patent Office action, and two new claims were submitted . . . The patent was issued July 23, 1957." (257 F. Supp. at page 381).

Even as the original 1951 application contained no [88] specific instructions for the avoidance of deep penetration, so, too, the claims submitted under the continuation-in-part application contained no specific words instructing the operator to "avoid deep penetration". They, however, contained other instructional factors for making the process

work: (as in the case of the first claim under the continuation-in-part application) "*while* avoiding deep penetration of the molten metal bath by the jet"; and (in the second claim) "*while* avoiding deep penetration of the molten metal by the jet, and controlling the area of impingement such that a relatively confined zone of direct oxygen-molten metal contact is established and maintained" at the bath surface; and (in the third claim) "*under such conditions* that deep penetration of the molten metal by the jet is avoided, and a relatively refined zone of direct oxygen-molten metal contact is established and maintained;" and (in the fourth claim) "*without* deep penetration of the bath by the jet." [15]

[89] If, in fact, the applicants had pointed out and distinctly claimed "avoidance of deep penetration" as the subject matter which they regarded as their invention, such a fact would have undoubtedly appeared in the claims. (*Application of Borkowski,* 422 F. 2d 904, 909, C.C.P.A., 1970). Clearly this was the thinking of both the District Court and the Court of Appeals.

Analyzing the original four claims of the continuation-in-part application, we observe that variations of the phraseology "avoidance or avoiding deep penetration" appears in all these claims. However, this language did not appear in isolation, but rather in combination with other highly relevant criteria. For instance, claim 1 contained

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[15] The continuation-in-part application specification (PX-2A) which remained unchanged throughout on this phase of the case contains this phraseology:

> Column 3, lines 45-46 "without deep penetration of the molten metal bath by the jet."
>
> Column 3, lines 73-74 ". . . under these conditions avoids a deep penetration . . ."
>
> Column 4, lines 70-71 "although the oxygen jet does not penetrate deeply into the molten metal bath . . ."
>
> Column 9, lines 17-18 "Under these conditions, deep penetration of the molten metal bath is avoided . . ."

reference to (1) jet diameter, (2) static jet pressure, (3) vertical placement of the jet, (4) central placement of the jet, and (5) surface placement of the jet, so that (6) the relatively confined zone of oxygen to molten metal with respect to the total bath surface area is established and maintained while avoiding deep penetration of the molten metal bath by the jet.

The second claim contained these elements: (1) jet diameter, (2) static pressure, (3) vertical blowing, (4) surface blowing, (5) central blowing, (6) slag layer initial displacement so as to establish (7) direct contact of the oxygen jet with the molten metal, while (8) avoiding deep penetration of the molten metal by the jet, and (9) control of the area of impingement, such that a relatively confined zone of direct oxygen molten metal **[90]** contact is (10) established and maintained at the bath surface area.

The third claim contained these features: (1) jet impingement on the bath surface under such conditions that deep penetration of the molten metal by the jet is avoided, and (2) a relatively confined zone of direct molten metal contact is established and maintained.

The fourth claim included the following features: (1) vertical blowing of the oxygen jet (2) onto the surface of the bath (3) at the central portion, and (4) to establish and maintain a relatively confined zone of direct oxygen metal contact without deep penetration of the bath by the jet.

In an application for a patent for a process it has been held that "the steps comprising the process are the essential features for consideration in determining the right of appellants to a patent": *Application of Magat,* 240 F. 2d 351, 353, (C.C.P.A. 1957;) *In re Swain,* 154 F. 2d 118 (C.C.P.A. 1946.) While these four claims incorporated the references to nozzle jet placement, there was no specific claim by any of them of avoidance of deep penetration, as

the subject matter which the applicants regarded as their invention (§112). "Avoidance of deep penetration" was not featured in any of the four claims as were the other common factors, that is (1) vertical blowing, **[91]** (2) central jet blowing, (3) surface jet blowing, (4) establishment and maintenance of oxygen to metal contact, and the other factors.

If, as is now obvious, avoidance of deep penetration was not pointed out and claimed as a factor in the subject matter which the applicants claimed as their invention, it could not, in reality, be said that even if their wording was varied that they would have been abandoned as "factors" of the subject matter iself. Thus, if "avoidance of deep penetration" was the subject matter i.e., the gist of the invention, which the applicants regarded as their invention, one would have expected that the applicants would have set it out specifically and separately as such in the claims. Furthermore, it would have been set out specifically and separately and fully in the specification. Apparently, the common features hereinbefore enumerated as they were contained in all four claims, comprised the subject matter since they were "particularly [pointed out] and distinctly [claimed]" as such and as required by law. Thus "avoidance of deep penetration" was something else. And since it is invariably prefaced in the specification by such modific- **[92]** ations as "while", "under such conditions", "without" and "although", it is apparent that "avoidance of deep penetration" was a subsequent and intermediate result. Accordingly, if "avoidance of deep penetration" occurs as a result of practicing the teachings contained in the specification as they are delineated, pointed out, and claimed as the subject matter of the invention, it exists by virtue of the inventive features and resultantly because of them. That is, as far as instructions go, it is mere surplusage. It cannot be said that one resulting circumstance was, or could be, the subject matter, or the gist, or the heart of the invention.

The law requires only that claims state the subject matter of the patent and not how the patent is to be accomplished. *Bocciarelli* v. *Huffman,* 232 F. 2d 647, 651, C.C.P.A., 1956. Thus, the word "while" as it was used in the first and second claim, and the words "under such conditions" as used in the third claim, and the word "without" as used in the fourth claim were neither words of subject matter or instructions. They were explanatory or illustrative of intermediate results for making those skilled in the art of steelmaking aware of what to look for in the performance of the process. *Cummins Engine Co.* **[93]** v. *General Motors Corp.,* 299 F.Supp. 59, 90 (D.C. Md. 1969) Aff. 424 F. 2d 1368, C. A. 4 1970.

Process patents bear considerable similarity to combination patents as each relates to the component steps constituting the method.

Thus, even if the claims had been allowed as originally drawn, they could not have indicated that avoidance of deep penetration was the gist of the invention. As was pointed out in *Joseph Schmidinger and Tung-Sol Electric, Inc.* v. *Welsh,* 383 F. 2d 455, 459-460, C. A. 3, 1967;

> "We desire to make it clear that we are aware that the validity of claims of a combination patent cannot rest on any 'essential' element 'gist' or 'heart' asserted to lie in the invention."

This was based on authority from the Supreme Court in *Aro Manufacturing Co.* v. *Convertible Top Replacement Co.* 365 U.S. 366 (1961). In *Aro* a convertible folding top for automobile bodies was involved in the patent, and the patentee claimed that the patent covered the replacement of worn out fabric of the device. The opinion as delivered by Mr. Justice Whittaker asserts that:

> **[94]** "Respondent has strenuously urged, as an additional relevant factor, the 'essentialness' of the fabric element to the combination constituting the invention. It argues that the particular shape of the fabric was the advance in the art — the very 'heart' of the invention — which brought the combination up to the inventive level, and, therefore, concludes that its patent should be held to grant it a monopoly on the fabric." (365 U.S. at page 344).

The Court continues:

> "We cannot agree. For anything is settled in the patent law, it is that the combination patent covers only the totality of the elements in the claim and that no element, separately viewed, is within the grant. See the Mercoid cases, supra, 320 U.S. at 667; 320 U.S. at 684. The basic fallacy in respondent's position is that it requires the ascribing to one element of the patented combination the status of patented invention in itself." (365 U.S. at pages 344-345)

In *Mercoid Corporation* v. *Minneapolis-Honeywell Regulator Co.,* 1944, 320 U.S. 680 to which Mr. Justice Whittaker made reference, the questions involved an unpatented device which was embraced in the furnace assemblies ". . . which neither the patentee nor the licensee makes or vends," (320 U.S. at page 666), and for which evidently a patent extension right was later claimed. Mr. Justice Douglas who delivered the opinion there, said:

> "That result may not be obviated in the present case by calling the combustion stoker switch the 'heart of the invention' or the 'advance in the art.' The patent is for a combination only. **[95]** Since none of the separate elements of the combination is claimed as the invention, none of them when dealt with separately is protected by the patent monopoly. *Leeds & Catlin Co.* v. *Victor Talking Machine Co.* (No. 1), 213 U.S. 301, 318." (320 U.S. at page 667).

As related to the instant matter, an examination of the Suess patent as it was granted contains no reference either expressly or by implication that "avoidance of deep penetration" is either the "gist" or the "heart" of the inven-

tion. The separate claims of the patent so granted distinctly enumerated the various factors as they had been more or less included in the first four claims originally filed, some of which were contained in the first 12 claims. The combination of all of the elements going into and forming the subject matter as pointed out and distinctly claimed by the applicants was their invention. And the specifications with all of its explanation of prior art, failures, present objectives, process content, instructions for accomplishing the process objectives and examples or modes for performance of the variables of the patent process stress no separate elements of the process, but the combination elements or factors as necessary requisites for one skilled in the art of steelmaking to successfully perform the process.

[96] The *McLouth* District Court refers to the original 1951 application by Suess in the United States Patent Office to the effect that it was "claiming the gist of the invention to be the maintenance of a certain proper ratio between the bath depth and surface area". (257 F.Supp. at page 399) It is emphasized that Dr. Suess in the subsequent continuation-in-part application claimed "avoidance of deep penetration in the bath by the oxygen as the essence of the invention." (257 F.Supp. at page 399). Dr. Rinesch's affidavit on the June 1949 tests said " 'that a satisfactory refining, operation could be obtained so long as the oxygen jet does not penetrate deeply into the bath.' (DX-116, p. 4).[16] The Hauttmann affidavit considered the invention to be the creation of a limited center of reaction 'substantially in the surface layer' resulting in a controlled circulation of the bath. (DX-117, pp. 3-4." [17] (257 F. Supp. at pages 399-400). "Dr. Hauttmann also expressed his opinion that the limited center of reaction and circulation was brought about by the avoidance of deep penetration (DX-117 pp. 4-5)" (257 F.Supp. at page 400) "Dr. Trenkler the other

[16] and [17] DX-116 and DX-117 from McLouth record are PX-2-A in the J & L record.

[97] patentee, testified that the only significant difference in practice over prior teachings was a reduction of the *impact pressure* of the jet and, therefore, a lesser penetration into the bath by the jet than would have resulted from prior teachings. (R. 11,905) [18] Thus, at one time or another, all four of the patentees expressed their understanding that the avoidance of deep penetration was the basis of a successful oxygen steelmaking process." (257 F.Supp. at page 400) [19] (Emphasis added).

Despite all of its discussions concerning the avoidance of deep penetration and lessening of impact being the gist of the invention, the *McLouth* District Court Opinion never states that the Suess et al. process also consists of additional factors. Rather we are led to the inference that avoidance of deep **[98]** penetration or lessening of impact pressure is the sole ingredient of the patent process and holds the exclusive claim of total invention.

Yet, lessening of impact pressure is a mere physical or mechanical operation, and one which common sense belief would indicate any person skilled in the art of steelmaking (such as Schwarz, Miles, Durrer or Hellbrugge) could have easily made as a simple adjustment. Dr. Durrer himself acknowledged the momentous accomplishment, when he said, "I had not expected you to be able to solve this problem so quickly, and am therefore all the more delighted, now that I have been able to see the beautiful results with my own eyes. Now that the problem has been solved in principle, . . ." (DX-251-E)

[18] R. 11,905 from McLouth transcript is PX-J-35 p. 11,905 in J & L record.

[19] A distinction must be made here of what these applicants stated regarding the difference between the successful and unsuccessful tests on June 25, 1949, as contrasted with the unsuccessful venture of Durrer and Hellbruegge and of the prior art, not of the difference between the patent specification and the prior art.

[99] **V. Physical-Mechanical-Chemical**

The plaintiffs contend that the *McLouth* District Court's conclusion, that the specification does not support the words of the claim that a circulatory movement in the molten metal bath is chemically induced, is factually insupportable. Specifically they attack the District Court's conclusion that "The claim of a circulatory movement in the molten metal bath produced by chemical reactions in a localized reaction zone is simply not supported by the teachings of the specification of the patent in suit." (257 F.Supp. at page 436).

This conclusion was based on a determination that, ". . . plaintiffs are forced to engage in tortured construction of the specification and claims in the patent in suit in order to find support in the specification for a claim of reaction-induced circulation." (257 F.Supp. at page 438) The *McLouth* District Court found that the oxygen jet mechanically causes bath circulation. If this conclusion is valid its support must lie only in the Suess et al. patent specification.

I have exhaustively searched the patent specification for supports for these findings in the Opinion and have been unable to do so. I have come to the conclusion that the only possible **[100]** support upon which any possible base may be laid lies in the words "brings about a flow in the molten metal" (col. 4, lines 30-31), when the patentees stated that "It is believed that application of the oxygen jet substantially vertically or approximately vertically upon the central portion of the bath surface brings about a flow in the molten metal from the center of the surface of the bath downwardly" (col. 4, lines 27-32). Here it will be seen that the patentees have merely expressed a theory of what they believe happens on the inside of the activated furnace, and from the chemical explanation as it is a little later presented that the result "brings about a flow" which occurs after the "application" is made of the oxygen jet "upon the central portion of the bath surface". (col. 4, lines 26-30) In order to comprehend this it is advantageous to understand the preliminary statements made in the patent.

In examining the objections to the prior art set out in this patent (col. 1, lines 37-73; col. 2, lines 1-35), vis-a-vis the patent's object (col. 2, lines 36-73, col. 3, lines 1-12), we see a two-fold process: First, that which the steelmaker is required to do, i.e., the mechanical performance; and second, the resultant behavior of the metal bath after the steelmaker **[101]** has performed his instructed functions, i.e., the chemical performance.

The requirements for the operator's physical performance are specifically set forth:

According to the process of the invention, the high purity oxygen jet is blown vertically, or approximately vertically upon the central portion of the surface of a bath of molten metal . . . the jet having a diameter at the point of origin or blast nozzle of about 1 millimeter (1/25 inch) per ton of charge, having a relatively low static pressure of from 5 to 25 atmospheres (about 75 to 375 pounds per square inch), preferably at about 8 to 12 atmospheres (about 115-175 pounds per square inch), with a blast nozzle spaced from the bath surface from at least 150 millimeters (about 6 inches) up to about 2000 millimeters (about 80 inches), spacing is such that direct contact of the oxygen jet and the molten metal is established and maintained throughout the refining period. (col. 3, lines 36-64)

These teachings involve purely physical activity on the part of the steelmaker. Thus, even the act of causing the oxygen jet to impinge upon the surface of the bath is includable **[102]** in the physical or mechanical instructions to the operator.

The steelmaker is told that in so operating, the area of jet impingement is controlled (physically) to produce a relatively confined zone of direct oxygen to molten metal contact with respect to the total surface area of the bath,

and this (now chemically) produces a sufficiently high reaction velocity of oxygen and bath constituents to insure development of autogenous heat sufficient for the completion of the refining process in a minimum of time, consistent with controlled temperature and control and development of necessary process conditions such as (1) fluid slag, (2) avoidance of overoxidation (undue loss of iron to slag), (3) avoidance of stopping, (4) avoidance of impairment of the refractory bottom, and (5) isolation of the refractory walls to prevent injury to them. (col. 3, lines 47, 63-75, col. 4, lines 1-5)

The operator is further instructed to maintain a ratio of depth of bath to surface area from about 1 to 5 to about 1 to 28, or in terms of the ratio depth to diameter of the circular bath between 1:2.5 and 1:19.[20] The reason for this **[103]** ratio of depth of bath to surface area of the bath is that it "augments the protection afforded to the refractory lining of the refining vessel and is also beneficial to the progress of the refining reactions to produce finished steels of low impurity content comparable to those produced by the basic open hearth process." (col. 4, lines 7-25)

Commencing with col. 3, line 64 to col. 4, line 6, we learn of the results produced from the instructed physical actions of the steelmaker. While these results are initiated by the physical or mechanical acts of the steelmaker, they are in themselves no longer physical but rather chemical.

Although it is the steelmaker who physically places or puts together the various components such as the molten iron and oxygen, it is a natural phenomenon which produces the sufficiently high reaction velocity caused by the oxygen combining with the bath constituents so as to de-

[20] These figures are taken directly from col. 4, lines 15-25 of the specification. However, Dr. Elliott testified (PX-J-19 p. 6103) ". . . that is an arithmetic error with regard to 1:19. It should be 1:6."

velop autogenous heat sufficient to provide the completion of the refining process. (col. 3, lines 16-27)

It is not the physical or mechanical pressure of the oxygen jet which causes the autogenous heat, but rather the combination of oxygen with the oxidizable impurity contained in **[104]** the bath. And it is this heat that causes the completion of the refining process. (col. 3, lines 64-73)

The specification clearly discusses the chemical consequence of the jet's impingement on the molten bath surface:

> "Due to the very high affinity of oxygen for iron, initial contact of the high purity oxygen jet with the molten metal bath causes a rapid combination of oxygen and iron to form FeO in the confined central reaction zone. This is demonstrated by ignition of the oxygen and the propagation of a visible flame within the first minute of blowing. This reaction, together with oxidation of impurity elements, such as silicon and manganese, develops extremely high temperatures in the zone of direct oxygen contact with the molten metal which approach the boiling point of iron, as demonstrated by the evolution of a fume containing iron oxide and manganese oxide. A portion of the iron oxide goes to the slag with the other oxidized elements and a portion diffuses into the bath under the influence of the bath circulation, so that within the first three minutes of the blowing vigorous carbon combustion is initiated due to the high temperatures developed by these reactions. The ensuing reaction of carbon with the FeO and directly with the oxygen gas in the confined direct oxidation zone causes rapid formation of carbon monoxide and the formation of this CO causes a strong boil or agitation of the bath, which augments the bath circulation to continuously present unrefined metal to the oxygen gas reaction zone and to create a slag-metal emulsion. The oxygen jet thus contacts the emulsion of bath and slag components which presents a larger reaction surface and causes the refining reactions to progress rapidly although the oxygen jet does not penetrate deeply into the molten metal bath and is confined to an impingement area at the central portion

of the bath surface. This vigorous boiling action is opposed by the pressure of the oxygen jet only in the area of impingement . . .'' (col. 4, lines 43-74)

[105] The action thus described is purely chemical, commencing from the initial contact of the high purity oxygen jet with the iron contained in the molten metal bath to the completion of the refinement.

Jean Bogert states in his book *Fundamentals of Chemistry* W. B. Saunders Co. (Phila) Seventh Edition, 1953, at pages 138-139:

> ''Only a few substances have such a great 'chemical affinity for each other that they will unite spontaneously, as iron reacts spontaneously with the oxygen and moisture in the air to form rust . . .', and chemical affinity or activity depends upon the atomic structure of the elements . . . And where such chemical affinity exists, reaction between them may be accelerated by the application of heat and after that the heat generated keeps it going.''

In the determination of invention and patentability it is of no concern to a court that an inventor does not know or cannot prove the scientific basis or reason for the working of the invention, since he is not legally required to comprehend the scientific principles on which the practical effectiveness of his invention rests. *Application of Aufhauser,* 399 F.2d 275, C.C.P.A. 1968. The law is concerned only with the fact that the patent works. *Eames* v. *Andrews,* 122 U.S. 40, 55-56 (1886). As Mr. Justice Matthews, speaking for the Court in *Eames* said **[106]** (at pages 55-56):

> ''It is to be observed that the scientific theory and principle, the application of which is supposed to constitute the invention of Colonel Green, are not set forth either in the original or re-issued patents. This feature was commented upon by Mr. Justice Blatchford in *Andrews* v. *Cross,* 19 Blatchford, 294, 305, as follows: 'It may be that the inventor did not know what the scientific principle was, or that knowing it, he omitted, from accident or design, to set it forth. That does not vitiate the patent. He sets forth the process or mode of operation which ends in the result, and the means for working out the process or mode of operation. The principle referred to is only the why and the wherefore. That is not required to be set forth . . . [T]he specification contains a description of the invention and of ''the maner and process of making, constructing, compounding, and using it,'' in such terms as to enable any person skilled in the art to which it appertains to make, construct, compound, and use it; and, even regarding the case as one of a machine, the specification explains the principle of the machine, within the meaning of that section . . . An inventor may be ignorant of the scientific principle, or he may think he knows it and yet be uncertain, or he may be confident as to what it is, and others may think differently. All this is immaterial, if by the specification the thing to be done is so set forth that it can be reproduced.' ''

Thus, whether or not the chemistry was understood would be ''immaterial, if by the specification the thing to be done is so set forth that it can be reproduced.'' That it could be done, that it was a ''revolutionary'' invention adopted by the steelmakers the world over, that it produced beter steel than any which had **[107]** theretofore been produced by the prior art, equal to or better than quality of the open-hearth furnace, that it preserved the refractory linings, and that it necessitated a bare fraction of time required for the open-hearth process is all factually found in both *McLouth* Opinions. Thus, although I would ordinarily not need to examine the scientific principles or truths involved in this Suess et al. process, I am here compelled to do so in order to ascertain whether any misconception of those scientific principles or mis-interpretation of the wording of the specification as it may set forth those scientific principles is discernable in the prior opinions and brought about a final determination which worked an injustice without fault on the part of the plaintiffs.

From reading the detailed description of the chemical action contained in the specification, and from observing the effects produced in cyclical fashion once the oxygen jet impinges on the metal bath surface and makes contact with the iron, silicon, manganese and other impurities, it is impossible to separate the chemical effects from the physical impingement of the oxygen jet itself.[21] Nevertheless, to make a declaration **[108]** that the specification asserts that it is the physical action of the jet which produces the refining action in the molten metal, cannot be reconcilable with the meticulous wording of the specification relating to the chemistry involved.

In the internal combustion engine, a series of electric sparks are arranged alternately to ignite air (oxygen) enriched mixtures of fuel and cause explosions which in turn result in cams moving and with these the wheels of a vehicle. Would it then be logical to say that it was the sparkplugs' ignition which caused the wheels to move without giving the necessary intermediate credits? Where a dynamite blast is set off by an electric spark initiated by a plunger hundreds of yards away, is it logical to say that the plunger causes the chemical explosion rather than the ignition? Yet, in analogous fashion that seems to be the conclusion of the *McLouth* District Court regarding circulation. All of the chemical results are due to the physical impact of the jet as it contacts the metal impurities, yet at some point the physical and the chemical reaction may be separated (or joined). This, the *McLouth* District and Appellate Courts failed to do.

While the *McLouth* District Court relied upon the references **[109]** contained in col. 4, lines 26-38, and col. 4, lines 63-67, it is singular that no reference was made to col. 3 where instructions are given for the physical action of the steelmaker required to "produce a sufficiently high reaction

[21] We shall learn more of these respective forces and their relationship to each other later.

velocity of the oxygen with the bath constituents to insure the development of autogenous heat. . ." (col. 3, lines 64-73). It is this action which initiates the chemical action: "Due to the very high affinity of oxygen for iron, initial contact of the high purity oxygen jet with the molten metal bath causes a rapid combination of oxygen and iron to form FeO in the confined central reaction zone . . ." (col. 4, lines 43-66)

Several other references should be pointed out which indicate that the applicants were cognizant of and related the chemical reactions produced by physical impingement of the oxygen jet.

> ". . . it is a characteristic of the process of the invention that in the confined zone of direct oxygen reaction at the surface of the molten metal bath, the oxidation products of the impurities in the pig iron, such as silicon and manganese, as well as the oxidized iron form an early fluid slag which is always very rich in oxides, that is, highly oxidizing. With the formation of the slag-metal emulsion, the iron oxide reacts with the carbon present in the bath, primarily outside of the direct oxygen-metal reaction zone, and since such slag-metal reactions, are endothermic, the molten bath is maintained cooler in the vicinity of the walls of the refining vessel or converter." (col. 5, lines 60-72)

[110] The patentees again differentiated between the mechanical action of the jet and its chemical action in these words:

> "Under these conditions deep penetration of the molten metal bath is avoided, while the necessary displacement of the slag cover to maintain direct oxygen to molten metal contact is insured. However, in the unusual circumstances of an abnormally stiff slag cover, the blow may be initiated using mechanical means for penetrating the slag cover to establish oxygen to metal contact." (col. 9, lines 17-24)

We recognize that the blowing of the jet and the displacing of the slag by that means is also "mechanical."

It is illogical to dispute the fact that this refinement action is all physical action, especially in view of the detailed explanation of the sequential chemistry contained in the specification: First to the development of autogenous heat (col. 3, lines 66-67); second, to the development of "extremely high temperatures in the zone of direct oxygen contact with the molten metal which approaches the boiling point of iron" (col. 4, lines 50-53); third, to the movement of a portion of the iron oxide to the slag with the other oxidized elements and a portion diffusing into the bath under the influence of the bath circulation, so that within the first three minutes of the blowing, vigorous carbon combustion is initiated due to the high temp-**[111]** eratures developed by these reactions" (col. 4, lines 54-60); and fourth thereafter "the ensuing reaction of carbon with the FeO and directly with the oxygen gas in the confined direct oxidation zone [causing] rapid formation of carbon monoxide and the formation of this CO [causing] a strong boil or agitation of the bath. . . " (col. 4, lines 60-64). It is this boil or agitation of the CO which "arguments the bath circulation to continuosly present unrefined metal to the oxygen gas reaction zone and to create a slag-metal emulsion." (col. 4, lines 64-67)

We are also informed of the additional part which the high temperature plays in the process: ". . . it is a characteristic of the oxygen-steelmaking process that the high temperature developed in the reaction zone between the bath metal and the slag cause a rereduction of manganese from the slag into the bath during the latter portion of the refining period." (col. 7, lines 29-34) In this connection the applicants tell us the important part they played because ". . . the early fluid basic and highly oxidizing slag formed provides an accelerated rate of phosphorus and sulphur removal from the bath, leaving the finished steel very low in both elements." (col. 6, lines 5-19)

[112] In the patent in suit, once the manual or physical action is provided, the resultant chemical action becomes dominant. Thus, within the physical parameters set by the operator, the chemical reaction of the components involved remain relatively independent.

The Suess specification teaches that the high temperature is self-generated—autogenous (col. 3, line 25), and up to now we know that the oxygen jet contacts the oxidizable elements contained in the iron bath, and that this produces the high temperature. Accordingly, the *autogenous generation of heat is the chemical result of the physical impingement of the oxygen on the oxidizable elements* contained in the bath.

Thus, reduced to its simple components, the patent wording separates the physical or mechanical from the chemical reactions. The steelmaker applies the oxygen jet and as long as he does, it is a physical action; and the oxygen coming in contact with the oxidizable elements combines and reacts in a natural way, and as long as that occurs it is a chemical. If the oxygen is stopped at any moment by the steelmaker, the chemical reactions will also stop.[22] If the elements are completely oxidized, the chemical **[113]** reactions cease.[23]

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[22] This was demonstrated on a number of occasions, but particularly as movies were made at Linz, Austria, in testing the direction of rudders in the molten bath of a 50-ton ladle for a 30-ton test plant, the oxygen was turned on and off for each demonstration. As the oxygen was turned on the flares of light showing the outthrow became instantly visible and as the oxygen was turned off, the flares of light abated. (PX-161, see also PX36C, 36D and 185A.) In this respect the application of oxygen as an oxidizing element in the exothermic process shows similarity to the application of electric current in the electrolytic process which is endothermic.

[23] The specification specifically provides: "The vigorous boil . . . continues up to the carbon end point . . . when the flame dies and carbon combustion is completed, the bath becomes relatively quiet and intimate contact between the slag and metal bath ceases." (col. 6 lines 62-69)

Up to here I have set forth in a detailed fashion the chemical action which results when the oxygen and metal contact is made. I do not deem it necessary to analyze the specification as it describes further chemical actions. I merely point out that the original combination of oxygen and oxidizable products produces heat and so expands. Thus, I note the movement of the iron oxide and the carbon monoxide as it is formed in the impingement-reaction zone into the bath where their high temperatures are diffused onto less heated portions within the bath and so produce further chemical reaction. (col. 4, lines 54-75, col. 5, lines 1-5) The latter continue after the bath elements are cooled to return to the reaction center at the [114] center surface of the bath, where they become reheated and again pass down into the bath for the sequential or cyclical diffusion of heat into the other portions of the bath. This endothermic chemical reaction and secondary conversion process continues until the free carbon supply is exhausted at which time no matter how much oxygen is supplied, the bath becomes relatively quiet; (col. 6, lines 66-72). With the quieting of the bath and with the failure of the oxygen jet to have any further effect, the chemistry is completed. The lack of activity in the bath, after the carbon end point has been attained clearly dispells the theory of physically induced circulation.

[115] **VI. Circulation—How Induced**

Mr. Justice Matthews said (*Eames* v. *Andrews*, supra, 122 U.S. at page 56):

> "An inventor may be ignorant of the scientific principle, or he may think he knows it and yet be uncertain, or he may be confident as to what it is, and others may think differently. All that is immaterial, if by the specification the thing to be done is so set forth that it can be reproduced."

The question is whether or not the scientific principles involved here were misinterpreted, or misunderstood by the

McLouth Courts to such an extent that any such misinterpretation without fault of the plaintiffs, contributed to an inequitable determination."

I repeat one of the excerpts found in the *McLouth* District Court Opinion:

> "Thus none of the references in the specification relied on by plaintiffs teaches *in so many words* that circulation of the bath is produced by chemical reactions as claimed." (Emphasis added). (257 F. Supp. at page 437).

It must be remembered that the specific references were not [116] addressed to lawyers or judges but to those skilled in the art of steelmaking. 35 U.S.C. § 112. Thus it is not necessary that every detail be precisely explained.

In searching the record for an answer as to whether there was a misinterpretation of the law as it relates to scientific principles, I noted some confusing language by defendant's counsel apparently for the purpose of showing that the specification taught that the oxygen jet caused the "bath circulation" and that this preceded the oxygen-iron FeO formation. During the cross-examination of Dr. Hauttmann (R. 2515) the following colloquy took place between counsel for the defendant and the District Court: (R. 2516-2517)

> "Mr. Groner: Column 4, line 54: 'A portion of the iron oxide goes to the slag', and then it goes on to say a second portion 'diffuses into the bath under the influence of the bath circulation'; but it does not even suggest, as the witness has already testified, that any chemical reaction induces the bath circulation. The bath circulation distributes the iron oxide.

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[24] I said (V at page 20), that I did not need to examine the scientific principles or truths involved in the Suess et al. process, and was only doing so to ascertain whether any misconception of those scientific prniciples or misinterpretation of the wording of the specification set forth was instrumental in bringing about a final determination which worked an injustice without fault of the plaintiffs.

THE COURT: What isn't clear to me is this first sentence here, 'A portion of the iron oxide goes to the slag'. The iron oxide of what, and where did it come from?

Mr. Groner: The iron oxide which is caused by the combination of the carbon with the oxygen—or with the iron and oxygen to form FeO. Actually, if you went back to line 43, Your Honor——

[117] THE COURT: Yes, I understand that it is iron mixed with oxygen to create iron oxide, but it starts right out here by saying, 'A portion of the iron oxide goes to the slag with the other oxidized elements and a portion—that is, a portion of the iron oxide—diffuses into the bath under the influence of the bath circulation.'

Mr. Groner: Well, now, the only question with which we are here concerned, your Honor, is what causes the bath circulation . . . And obviously this sentence here presupposes that the bath circulation has already been created and set into motion. *There is nothing here that deals with the creation of a circulation*—certainly one induced by reaction—and the circulation as such is created, or at least the only description of the patent dealing with the creation is that which occurs in column 4, lines 26 to 38." (Emphasis added)

Even if one accepts the contention of counsel for the defendant that there is nothing in the specification which deals with the creation of a circulation, the tests both in *McLouth* and *J & L* as well as the discussion of counsel and the witnesses demonstrate that a circulation does occur in the bath. Furthermore, the specification said "It is believed that the application of the oxygen jet . . . *brings* about a flow in the molten metal . . ." (Emphasis added) (col. 4, lines 27-31)

Even though counsel for the plaintiffs conceded that there were no words which stated that the oxygen jet originated the circulation, the *McLouth* District Court concluded that the circulation was of a physical origin and found that "The [118] specification teaches a circulation brought about by the jet . . ." (257 F.Supp. at page 437) It held that col. 4, lines 28-34 of the specification "teaches that chemical reactions produce only an 'agitation of the bath' rather than circulation, and that the agitation thus produced merely 'augments' the circulation already in existence." (257 F. Supp. at page 436) By this last statement I assume that the District Court meant "the circulation already in existence" was caused by what it strongly inferred was the physical action in the oxygen jet.

In col. 4, lines 28-34, the specification speaks of the *belief* that the oxygen jet applied as instructed "*brings about a flow* in the molten metal from the center of the surface of the bath downwardly . . ." (Emphasis added). (Col. 4, lines 30-32). Yet the *McLouth* District Court separates this from the chemical actions which are related in the same sentence, ". . . so that portions of the unrefined metal are continuously *presented to a localized center of direct oxygen reaction* with the bath metal, while *reacted or oxidized* portions of the bath *move away from this reaction center.*" (Emphasis added). (Col. 4, lines 34-38). Again, all of this is the patentees' belief about the "apparent circulation of the molten material" (Col. 4, lines 27-28, 38-39).

[119] I have already explained that the only hold for a determination that the circulation in the bath was physically caused on the basis of the words "brings about a flow" in in the theory belief portion of the specification of the action or mechanism of the process, commencing with col. 4, lines 26 et seq., and particularly as the words "brings about a flow" are contained in line 30. As I have already indicated this is not a statement of the physical cause for the circulation, but rather a theory of the chemical reaction upon "application of the oxygen jet". This is, however, explained when the patentees describe the chemical action after impingement has been made and ignition occurs within the first minute of flowing. Thus the oxidation reaction "develops extremely high temperatures in the zone of direct oxygen contact with the molten metal", whereupon "a portion of

the iron oxide goes to the slag with the other oxidized elements and a portion diffuses into the bath under the influence of the bath circulation." Here now the patentees assert that their former statement of "brings about a flow in the molten metal" is enhanced by the development of the "extremely high temperatures in the zone of direct oxygen contact **[120]** with the molten metal." Under these circumstances there should be no ambiguity for the person skilled in the art of steelmaking, or for that matter to the chemist. In any event, there is no room here for an inference that the oxygen jet physically produces a circulation in the bath. As we shall see later the testimony of all of the expert witnesses indicated at the most that all the oxygen jet could possibly do was to create a bend or hollowing or indent in the surface of the bath, but that this did not cause, according to one of the experts from the Massachusetts Institute of Technology, more than that. But even if any ambiguity existed here, the interpretation should be made in an effort to save the patent.

From hereon, the specification teaches that as the molten metal reaches "the boiling point of iron . . . within the first three minutes of the blowing vigorous carbon combustion is initiated due to the high temperatures developed by these reactions. The ensuing reaction of carbon with the FeO and directly with the oxygen gas in the confined direct oxidation zone causes rapid formation of carbon monoxide and the formation of this CO causes a strong boil or agitation of the bath, which augments the bath circulation to continuously present unrefined metal to the **[121]** oxygen gas reaction zone . . ." (Col. 4, lines 52-65). It is obvious then that the carbon combustion increases the boiling action, and this "strong boil or agitation of the bath" is in itself a moving force that augments the movement in the bath to "continuously present unrefined metal to the oxygen gas reaction zone and to create a slag-metal emulsion."

Thus we see that the first oxidation process resulting from the oxidation of iron, silicon, manganese and other impurities creates the first phase or high temperature activity in the central surface portion of the bath, i.e., "in the zone of direct oxygen contact with the molten metal" (Col. 4, lines 51-52). The boil then initiates the second phase of the chemical process as it moves upwardly and downwardly into the bath and away from the "zone of direct oxygen contact with the molten metal". As the patentees indicate, this "represents, for the most part, primarily endothermic reduction of FeO by carbon to form the evolved carbon monoxide, which reaction thus effectively *encompasses* the zone of direct oxygen reaction at which the highest temperatures prevail . . ." (Col. 4, line 75, Col. 5, lines 1-4).

Accordingly, it appears these have been technically set out **[122]** so that experts skilled in the art of steelmaking, including Durrer and Hellbruegge, could understand it.

In any event, none of these references support any finding that a circulation in the molten metal bath is physically or mechanically brought about by the force of the oxygen jet. Wherefore, it cannot be said that the specification so states. Rather the implication of the specification is strong that circulation occurs as a result of chemical action.

No one has been able to look inside a seething vessel when oxygen is blown in accordance with the Suess process, although some testimony was presented by the McLouth experts that they looked into model demonstrations and were able to see an upwardly directed circulation. Thus, at the least, the beliefs of the patentees are scientific theories which they need not prove and which in fact need not even be true. *Reeves Bros. Inc.* v. *U. S. Laminating Corp.*, 282 F. Supp. 118 (D.C.N.Y. 1968) Aff. 417 F. 2d 869 (C.A. 2—1969).

I have personally observed these operations in Ashland, Kentucky and at the defendant's mill at Aliquippa, Penn-

sylvania. From first hand knowledge I know that after the molten contents are placed in the vessel, the vessel is righted and the oxygen is turned on. Immediately fireworks erupt from the top of the vessel, and a rumbling noise ensues. After some twenty minutes, **[123]** more or less, while the oxygen is still flowing, the fireworks and the rumbling subside following which the oxygen jet is withdrawn. No one of the *McLouth* or *J & L* witnesses disputed the existence of these visible and audible phenomena. And so as I have seen, the process starts and comes to an end both visibly and audibly, while the operators stand by. The natural laws of chemistry produce these phenomena from beginning of the application of the oxygen to the end of the oxidation process in which we see the refinement of crude molten iron into finished steel.

A patent validity determination must ultimately be based on the specification as it relates to the scope of the invention. Nevertheless, where technical matters are contained in such a patent, it is appropriate for a trial judge to consider the expert opinions given by such witnesses and give them such weight as he determines they deserve. But the conclusions of such witnesses are not binding on the court. This is true whether the opinion evidence is addressed to a judge, a jury or to a statutory board. *Dayton Power & Light Co.* v. *Public Utilities Commission*, 292 U.S. 290, 299, (1934). Where, however, an expert witness testifies to relevant factual circumstances, such testimony is no different from non-expert witnesses.

[124] William David Smith, the Superintendent of the Steel Purchasing Department of J. & L at Aliquippa, Pennsylvania testified before me concerning audibility and visibility in the basic oxygen furnace. First as relates to the beginning of the operation, he testified: (R. 3984)

Direct Examination

"Q. What happens so far as the operator can see when the oxygen first strikes the molten iron?

A. The first thing that happens is that we get ignition between the oxygen and the molten iron. A flame evolves out of the mouth of the furnace, which we term ignition.

Q. Is the operation a quiet one?

A. No, sir. It is very loud."

And later as follows: (R. 3988-3989)

Q. Now, have you observed any vibration of the vessel or the lance during a blow?

A. Yes, sir. The furnace vibrates slightly within the limits of the herringbone gear on the drive that permits it to walk a little bit. Also, the lance will vibrate while we are blowing.

Q. Can you tell by sound or otherwise whether there is any churning or sloshing inside of the vessel?

. . .

A. Well, you can watch the ejections from the furnace and the flame and the sound. Yes, there is movement going on, there is action inside the furnace.

[125] Q. Is it mild or moderate or more than moderate?

A. No. It is rather violent and dynamic.

THE COURT: Something on the order of a very small volcano, if you ever heard anything about volcanos.

THE WITNESS: Yes, sir, very much.

THE COURT: Volcanic in action.

THE WITNESS: That is right.

THE COURT: Because of a certain amount of turbulence that you may not see but feel?

THE WITNESS: But you know it is there.

THE COURT: And because of the smoke and the other matters we see, sparks and the like, that are erupted after ignition?

THE WITNESS: That is correct.

THE COURT: Not before ignition?

THE WITNESS: Yes, sir, that is correct.

THE COURT: What do you hear before ignition?

THE WITNESS: Before, sir, the only thing you might hear is some crackling and reaction between the hot metal and the scrap going on."

I have mentioned that anyone who views the basic oxygen process from beginning to end has both visual and audible evidence of when it starts and when it is completed. The specification merely indicates that there are the visible **[126]** effects of flame and fume at the very beginning and the quieting of the bath at the end of the carbon oxidation reaction. (col. 4, lines 43-54; col. 6, lines 67-69).

While it is impossible to see inside the seething vessel after the oxygen jet has been applied, scientists can by applying known scientific principles theoretically arrive at an appraisal of what is occurring above and within the bath.

In an attempt to demonstrate what was occurring in the bath, innumerable tests were presented to the *McLouth* District Court and here. However, the *McLouth* District Court gave no credence to the plaintiffs' demonstrations.

> "An 'explosive bubble' mechanism which would tend to justify a conclusion that reaction-induced circulation in a molten metal bath could be down in the center was advanced by Dr. Chipman and Dr. Shapiro for the first time at the trial of this litigation in 1963 and 1964 (R. 480-482, 490-492, 496-500, 3696-3698) and was admittedly not contained in any literature prior to the time of trial. (R. 4250-4251)." (257 F.Supp. at 438)

The fact that the methods were not shown to be contained in prior literature, does not in itself discredit their validity as demonstrative techniques.

Although defendant's experts presented several demon- **[127]** strations, the *McLouth* District Court concerned itself with a series conducted at the University of Michigan at

Ann Arbor. One of these, Demonstration No. 7, was discussed and extensively relied upon in the Opinion to support the defendant's contention that with deep penetration, good steel could be produced, even though the refractory bottom was damaged. Despite this, the Opinion contained a finding that McLouth practiced the Suess et al. process (257 F.Supp. at page 386), and that "avoidance of deep penetration was the gist of the [Suess et al.] patent". (257 F.Supp. 403, 406)

Although the patentees did make specific declarations of the chemistry of the process, they did not in the specification or in the claims "in so many words" state what the actual direction of the circulation was; only that this was "an apparent" circulation which they "believed" was downward in the center, outwardly at the bottom, upwardly at the sides and then inwardly at the top to the center. (col 4, lines 27-38) However, I keep in mind that Mr. Justice Matthews said in *Eames* v. *Andrews, supra,* (122 U.S. at page 26) that it was not incumbent upon the patentees to understand the scientific principles involved, and that they may have been mistaken.

The plaintiffs produced an impressive number of eminent **[128]** witnesses, particularly from the Massachusetts Institute of Technology, who testified on the chemistry and fluid dynamics involved in the Suess process. They testified that the impingement of the oxygen jet created the chemical reaction which resulted in high temperatures and caused both an upward as well as a downward movement in the bath. They testified that the deeper insertion or deeper penetration of the jet into the bath created a mechanical or physical force the net result of which reversed the overall direction of circulation and at the same time had the tendency to cause damage to the bottom and wall refractories. Although there was some disagreement even amongst the plaintiffs' experts, it was insubstantial and for the most part all agreed to the brief statement which I have just made.

The defendant's experts did not dispute that a circulation existed in the specific oxygen vessel as the process was applied. However, they contended that the direction was opposite to that indicated by the plaintiffs' experts, that is, that the movement was upward in the center [25] and outward at the top, downward [129] at the sides and inward at the bottom. This they attributed to the mechanical injection of the jet into the bath. Furthermore they stated the only way the bottom of the refractories would be injured was by causing the oxygen jet to come in contact with that portion of the refractory.[26]

The testimony of the defendant's experts was presented in support of its contention that it practiced deep penetration of the oxygen jet in accordance with the prior teachings of Schwarz and Miles. However, the Opinion contained a finding to the contrary. (257 F.Supp. at page 380)

Thermal expansion, movement and circulation are an inherent part of the specification as it teaches in col. 4, lines 43-54, that initial contact of the oxygen jet with the molten metal bath causes "a rapid combination" in the formation of FeO and that this is demonstrated by ignition and a visible flame in the first minute of blowing, and further oxidation of the impurities such as silicon and manganese [130] "develops extremely high temperatures approaching the boiling point of iron as demonstrated by a fume."

While the theories of direction and cause of circulation flow in the molten bath continued to be disputed by the experts on both sides, an effort was made by the defendant's experts to show that the Suess process was in reality a restatement of the prior arts of Schwarz and Miles, additionally containing only the *belief* of circulation direction in the bath. In spite of the contentions of the defendants' experts, they nevertheless factually supported the chemistry explanations contained in the specification. For example, Dr. Flinn said that (PX-J-21 p. 6886):

> "The reaction of iron with oxygen would lead to a temperature increase."

Then, again he made certain answers as follows: (PX-J-25 p 8279A)

> "Q. Now, what is the condition that you have there, Doctor, from the standpoint of what you observe coming out of the converter?
>
> A. I observe fume and flame.
>
> Q. Is that ignition?
>
> A. Yes.
>
> • • •
>
> "THE COURT: How much time has elapsed?
>
> • • •
>
> [131] A. . . . That is about five seconds . . .
>
> Q. About five seconds, and what is the condition which you see at the mouth of the converter?
>
> A. Smoke and flame."

In describing the beginning of the regular vessel operations at the McLouth OP shops, the testimony of Lyle Johnson another of defendant's witnesses, is more specific: (PX-J-32 p 10989)

> "Q. (By Mr. Groner) In a normal blow about how long does it take, just by way of contrast?
>
> A. Normally ignition occurs almost immediately."

And at (PX-J-33 p 11061)

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[25] These witnesses never mentioned the recoil factor, concerning which I speak of later.

[26] As I said previously, I speak of this later (Comp. XIII) when I discuss a ruling contained in the Opinion on Demonstration No. 7 as conducted by the defendant at Ann Arbor, Michigan. Although I do indicate in that discussion that the Superintendent of the McLouth mills had testified that when the oxygen jet was injected into the empty vessel it did not damage the refractories. (PX-J-33 p. 11,100, Johnson)

"Q. Can you tell us what 'ignition' means when related to the jetting of oxygen on a bath of molten iron?

A. Ignition means the reaction of the oxygen with the iron or the impurities in the iron and is evidenced by an increase in temperature.

Q. Is there other evidence of the presence of ignition?

A. An evidence of the presence of ignition is usually smoke and visible flame . . ."

(PX-J-33 pp. 11228-11229):

"Q. This matter of ignition really signals the beginning of the oxygen refining process, does it not?

A. Yes, Mr. Webb.

[132] Q. In other words, it would be correct to say, would it not, that the process does not start until ignition occurs?

A. Yes, Mr. Webb, that would be correct . . . I would state ignition in the commercial operation to be the appearance of smoke and a visible flame at the mouth of the vessel."

This testimony of the defendant's witnesses is in accord with those of the plaintiff's expert witnesses as regards this phenomenon. Dr. Chipman said (PX-J-2 pp. 381-382):

"The ignition is a phenomenon which is recognizable by sound and also by the first appearance of a massive smoke emerging from the vessel. This has to do with the rapid burning going on at the junction of the oxygen with the metal surface.

. . .

THE COURT: You say the entire surface of the bath is momentarily burning?

A. Burning. Uniting with the oxygen. Not the entire surface of the bath, your Honor.

THE COURT: I see.

A. The entire surface of this impingement area.

THE COURT: Of the impingement area?

A. Yes.

THE COURT: I see."

Earlier Dr. Chipman said (PX-J-2 p. 384):

". . . Here the burning of the surface, the extraordinarily strong oxidizing reactions [133] between the oxygen and the metal bath, have heated the area of impingement to a quite high temperature, very commonly referred to as the hot spot or the area of impingement, and chemical reactions have set in here in full vigor . . . First, there is the development of the very high temperature. Second, . . . many bits of metal are thrown upwardly . . .

THE COURT: What is it that is thrown out, you say?

A. Metal. Hot metal is thrown out under oxidizing conditions . . ."

Then this is said (PX-J-2 p. 385):

"Now, other things show up as a consequence of the chemical reactions. One of these, and a very important one, is a downward central blow of metal immediately under the highly heated surface area . . .

THE COURT: You say that downward flow of the metal is caused by this chemical reaction?

A. It is caused by the chemical reaction in the heated zone. The flux materials are not much changed yet, because here we are talking about the first 15 seconds after ignition . . ."

Dr. Chipman also said (PX-J-3 p. 481):

"The impingement of the oxygen on the bath surface raises the temperature by chemical reaction, increases the temperature of the metal on the immediate surface to a quite high temperature . . .

The reaction of iron oxide in the hot spot with carbon is violent enough at 2900. At 4800 . . . I think to say it is explosive is not an exaggeration."

[134] And further (PX-J-3 p. 500):

> "Q. How soon after your heat is started, Doctor—that is, after the blow of the oxygen starts—do you realize this condition which you have described at the hot spot where you have these explosive reactions?
>
> A. This condition begins with the phenomenon which we call ignition . . . and the phenomenon of ignition marks the beginning of the evolution of a huge cloud of smoke. It marks the beginning of certain sounds which are clearly audible, . . ."

In this connection, Dr. Elliott said (PX-J-19 pp. 6120-6120-A):

> ". . . the fact that iron boils at this very high temperature would indicate that there were extremely high temperatures in the reaction zone. This is characteristic of high temperature reactions in the steel industry, the generation of iron fume. Where that occurs, one is sure that the temperatures are very high.
>
> Q. (By Mr. John Webb) Approximately what temperature?
>
> A. 4500 to 4900 degrees Fahrenheit."

Up to now we see that the contact of the oxygen jet, after it pierced the slag, with the metal surface produced certain chemical combinations which resulted in (1) heat and (2) a certain amount of movement. Although the creation of heat is spelled out quite clearly in a number of places, movement is not clearly stated. However, since the chemical actions and reactions are stated, one skilled in the art of **[135]** steelmaking will understand that movement is involved when the chemical actions are spelled out as they are in the specification.

The Opinion concluded that chemical reactions are not taught to be a factor creating circulation, and found particularly that, "This reference does not teach that when chemical reactions cease, circulation of the bath also ceases. Thus,

no casual connection is made explicit in this reference between chemical reactions and circulation." (257 F.Supp. at page 436)

First of all we have the information from the specification, itself (and confirmed by all the experts), that almost immediately ignition takes place and soon "extremely high temperatures in the zone of direct oxygen contact with the molten metal" results.

To say that upon ignition and the beginning of the generation of heat by the oxidation reaction, the Suess process equilibrium of the molten metal bath remains static and the same as it was before the oxidation process commenced, would be absurd. It is common knowledge that substances expand as they get hotter. Expansion resulting from heat energy is called **[136]** thermal expansion.[27] Expansion is the act or process of increasing in extent, size, number or scope. The word "expansion" is also defined as meaning to spread out, to diffuse, to make to occupy more space.[28] This means motion or movement: "[The] intermingling of particles of matter with other particles, moving under their own power from a region of higher to one of lower concentration is called diffusion.[29]

With ignition the specification tells us that "a portion of the iron oxide *goes to the slag* with the other oxidized elements and a portion *diffuses into the bath* . . ." (col. 4, lines 54-56). In describing the commencing action, it will be seen that the specification uses the words "goes" and "diffuses". These words, it will be observed, are descriptive of the chemical action after the jet has impinged and made

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[27] Energies, Forms and Changes by Brandywine, Stohlberg & Burnett, 1968, at page 190.

[28] Webster's New Collegiate Dictionary, 1949, at page 290.

[29] Chemistry in Action, 4th Ed., 1941, at page 109, by Rawlins, Struble and Gatewood.

contact with the metal, and after chemical action has been initiated by means of ignition and flame. With an understanding of the cause of the circulation as being a result of chemistry, there should **[137]** be no misunderstanding about the terminology "brings about a flow in the molten metal from the center of the surface of the bath downwardly . . .", as this exists in the preceding paragraph describing what the patentees believe is the apparent movement in the bath. This then does not mean that the words in the previous paragraph "that application of the oxygen jet substantially vertically or approximately vertically upon the central portion of the bath surface *brings about* a flow in the molten metal" as a mechanical result and of the action of the steelmaker, but rather the words "brings about a flow" (col. 4, line 30), "iron oxide goes to the slag" (col. 4, line 55), and "a portion diffuses into the bath" (col. 4, line 56) speaks simply of resultant chemical action.

I have elaborated on these words and their definitions in the specification in an effort to ascertain whether there is any significance in their context or content as used in the Suess specification. Since ignition and heat as the result of oxidation reaction occurs upon the impingement of the oxygent jet to the molten metal bath surface it is chemically self-explanatory. Obviously, then, expansion, movement and circulation are inherently a part of the specification's word picture as it commences with the description contained in the **[138]** specification (col. 4, lines 43-48) ". . . initial contact of the high purity oxygen jet with the molten metal bath causes a rapid combination of oxygen and iron . . ."

The complaint by the *McLouth* defendant which the *McLouth* District Court approved was not that the circulation in the bath was not chemically produced, but that rather the specification did not say so "in so many words as claimed." I have been discussing the specification's chemical reactions in the first few seconds when ignition and chemical actions were visible to witnesses both for McLouth

and for the plaintiffs, and which I observed the result thereof was movement.

Witnesses, however, spoke of another incident involved in these chemical reactions. After the first minute or so when the specification says "the high temperatures . . . approach the boiling point of iron . . .", this "extremely high temperature" causes the carbon and the oxygen gas in the confined direct oxidation zone to form carbon monoxide and in doing so, initiates a "strong boil or agitation of the bath, which augments the bath circulation . . ." (col. 4, lines 50-65) It will be observed here that the specification speaks of both the boiling iron and the formation of the carbon monoxide as occurring in the impingement areas of the oxygen and molten metal **[139]** bath, and that it is here that the carbon monoxide begins its agitation and augmentation of the circulation which already exists. We now know scientifically that circulation as worded in the specification originated with ignition at the point of oxygen to metal contact.

I have searched the *McLouth* record for testimony from the defense experts relating to the character of the activity in the industrial oxygen process vessel, and find very little which will be helpful in regard to the matter which I am about to discuss.

Dr. Nicholls said (PX-J-26 p. 8871):

> "A. Combustion is a chemical reaction, an oxidation process, . . ."

Further on, he said (PX-J-27 p. 9007):

> "In a combustion process, for an explosion, you must have ignition. You have to get that fire going."

However, he did discuss something of the explosive character of carbon monoxide.

Dr. Chipman testified quite elaborately in behalf of the plaintiffs in this regard (PX-J-2 p. 384).

> "Here the burning of the surface, the extraordinarily strong oxidizing reactions between the oxygen and the metal bath, have **[140]** heated the area of impingement to a quite high temperature, very commonly referred to as the hot spot or the area of impingement, and chemical reactions have set in here in full vigor."

He first called attention to the fact that this reaction causes a throw-out of many bits of metal upwardly, and he then said: (PX-J-2 p. 384):

> "The throw-out here is due to chemical reactions occurring in this highly heated zone."

The Court asked him a question and he answered as follows (PX-J-2 p. 384):

> "THE COURT: What is it that is thrown out, you say?
>
> A. Metal. Hot metal is thrown out under oxidizing conditions, and it is undergoing oxidation as it is thrown out of the furnace."

He said on another occasion (PX-J-3 pp. 490-491) that the iron oxide dissolved at that temperature in the heated zone and oxygen dissolved with it also dissolves carbon in the metal, all of which reacts very rapidly forming bubbles of carbon monoxide (CO). He said that this CO burns quite rapidly in oxygen, but that "a mixture of CO and oxygen is an explosive mixture which results in violent explosive formation of CO_2. He then testified that (PX-J-3 pp. 496-498) the upthrow of metal also results in a downward thrust "as a sort of kick from **[141]** the outthrow, a downward thrust on the metal, and bubbles of CO are shot downward." He said, too, that (PX-J-3 p. 498), the downward stream carries hot metal—very hot metal. He testified that (PX-J-3 p. 498), "The downward stream of metal carries with it downwardly dissolved oxygen, dissolved carbon, dissolved silicon, and dissolved manganese. These are all in solution in this downward stream." He testified that (PX-J-2 p. 388) "These bubbles of carbon monoxide are formed at this very high temperature with extreme rapidity, and this gives rise to the forces which thrown these sparks upward and also which exert this downward push." He was then asked:

> "THE COURT: What flows downward? Is it the carbon monoxide bubbles, or—
>
> A. Yes.
>
> THE COURT: Or is it the flow of iron?
>
> A. It is both."

When previously asked by the Court "You say the downward flow of the metal is caused by this chemical action?" The answer was "It is caused by the chemical reaction in the heated zone." (PX-J-2 p. 385) He said that (PX-J-2 p. 385):

> ". . . as a consequence of the chemical reactions . . . a very important one, is a downward central blow of metal immediately under the highly heated surface area."

[142] He continued to state that the reactions going on are both quite violent, both throw metal upwardly from the bath, both have a tendency to push downwardly in the bath, and both contribute to the rapid establishment of this circulatory movement downwardly below the hot spot. (PX-J-3 p. 491) Specifically at (PX-J-3 p. 497) he said:

> "The surface condition is quite tumultuous. Oxygen and CO come into contact with one another on the surface and react violently to form carbon dioxide . . . The explosion of these bubbles, the rapid formation of CO bubbles, which is effectively explosive in violence, throws metal upward."

It also has a downward thrust resulting "as a sort of kick from the out-throw, a downward thrust on the metal, and bubbles of CO are shot downward." (PX-J-3 p. 498).

The Court asked Dr. Chipman (PX-J-3 p. 498):

"THE COURT: I think you have answered this before, but will you explain again to me, unless you are going to develop that . . . just what causes this downward flow of the metal in the central part of the bath under the reaction zone.

A. . . . I would say it is a kick of something shot up. There is a kick downward against the metal."

Thus it is that we have expert opinion supports for the scientific explanations contained in the specification. First, **[143]** as a result of movement caused by high temperature, a portion of the FeO goes into the slag, and a portion of it is diffused into the bath; and second, thereafter, the boiling of the iron and the high temperature, formation of carbon monoxide, combining further with the oxygen, starting explosions with an upward push as well as a downward kick-back into the bath.

Thus to the expert, plainly enough, the specifications does say that the chemical action is the result of the combining of the oxygen with the various other chemical elements; that such combination or oxidation produces unusually high temperatures and certain behavior in the bath evidenced by flame, fume, boiling of the bath and turbulence, and that when the turbulence comes to an end, the chemical reaction comes to an end. The oxygen jet no longer causes any action.

We keep in mind that the complaint by McLouth which the *McLouth* District Court approved, was not that the circulation in the bath was not chemically produced, but that rather the specification did not say so "in so many words as claimed."

I find that natural laws, as they fall within the classification of chemistry, produce the circulation phenomena from beginning to end of the refinement of molten iron metal into finished steel.

[144]

VII. Localized Reaction Zone

If the Suess patent process is to be used by any person skilled in the art of steelmaking, it would seem he must know and understand the meaning and significance of the term "localized reaction zone" as set forth in the claims and as taught by synonymous expressions in the specification. This is so because the "triggering mechanism" the specification instructs, lies in the zone where oxygen and iron meet, under "controlled conditions".

The preliminary issues here revolve about whether or not the plaintiffs in *McLouth* sufficiently explained this factor to the *McLouth* District Court or, without fault on the plaintiffs' part, that Court utilized a fundamental misconception as to the technical significance of the "localized reaction zone."

The defendants in *McLouth* denied that there was such a thing as a reaction zone which was localized, or which could be localized, or that the term had any factual significance. They attempted by various experts and by demonstrations at Ann Arbor, particularly Nos. 5, 7 and 9, to show that by following **[145]** the prior art of Schwarz and Miles they could produce "good" or "ductile" steel. The fact that McLouth persuaded the District Court that the localized reaction zone and material agitation were a fiction, resulted not so much from the proof which the defendant presented in these regards, but rather from the District Courts conviction that "avoidance of deep penetration was the gist of the invention."

> "As for the 'localized reaction zone spaced a substantial distance from the refractory lining,' such a reaction zone could also exist even with deep penetration." (257 F.Supp. at page 426)

This conclusion was premised on a prior determination that:

> " 'The localized reaction zone spaced a substantial distance from the refractory lining' and the 'high tem-

perature' in such reaction zone are features of the claim which this Court considers anticipated by the Schwarz and Miles patents and therefore certainly obvious to persons skilled in the art.' (257 F.Supp. at page 404)[30]

[146] Since the Opinion does not divorce "avoidance of deep penetration" from "localized reaction zone", it held:

> "... plaintiffs cannot read the avoidance of deep penetration into the language of the claims referring to an impact 'a localized reaction zone spaced a substantial distance from the refractory lining' " (257 F.Supp. at page 426)

The Opinion does not find that a localized reaction zone did not exist, but refused to find that it existed at the top or central surface as set out in the specification and in Claim 1. What it found was that there was a reaction "anywhere the oxygen stream [might have engaged] the metal bath" (257 F.Supp. at page 439). The truth of this statement is uncontradicted as Dr. Chipman testified in response to the Court's inquiry **[147]** concerning reaction zones:

> "THE COURT: It is anywhere the oxygen stream may engage the metal bath. Is that what you are saying?

---

[30] This finding is based on conclusions as to Schwarz that:
"'• • • the reaction between oxygen and iron or iron-accompanying substances with the phenomena resulting therefrom, namely *local* over-heating and the accumulation of ferrous oxide, takes place in the center of the steel bath and therefore the walls of the vessel are not substantially attacked . . .'" (Emphasis added) (257 F.Supp. at page 404)

and

"Miles' teaching that 'the source of chemical oxidation reaction is located within the bath at a good distance from the refractory lining' *implies* a localized reaction zone, and, further Miles' teaching of blowing oxidizable elements in with the jet to 'increase the temperature *locally* where the jet strikes the bath so as to bring about the oxidizing action more rapidly' *suggests* a localized reaction zone with higher temperatures than the rest of the bath." (Emphasis added) (257 F.Supp. at pages 404-405)

> A. Yes, your Honor." (PX-J4 p. 909)

The high affinity and rapid combination of oxygen and iron occurs whenever oxygen is placed in intimate contact with molten iron. Since iron exists throughout the entire molten bath in which the oxygen jet is injected, it is quite logical to assume that when the jet is penetrated deeply into the bath that oxidation will occur throughout the bath. It is obvious then that whether one elects to practice Schwarz, Miles, Durrer, Hellbruegge or Suess, depending upon what degree of refinement and preservation of refractories and quality of steel one desires to achieve, a chemically induced reaction between the oxygen and the metal bath occurs.

Under these circumstances our inquiry leads to this question: Do the Suess specifications and claims actually teach a "localized reaction zone", which differs from the oxidation-reduction area prescribed by the prior art?

Miles uses the word "locally" for the purpose of indicating an increase in temperature where the jet strikes within the bath so as to bring about "the oxidizing action more **[148]** rapidly". In Miles, (DX-10A, page 3, lines 17-19): "The high speed of the fluid jet has the effect that the source of chemical oxidation reaction is located *within the bath at a good distance from the refractory lining.*" (Emphasis added). This practice is more specifically set forth by Schwarz (DX-5A, page 4, lines 24-25 and page 5, line 1) because "local overheating and *accumulation of ferrous oxide, takes place in the center of the steel bath* . . ." by which it is stated that the ferrous oxide formed from the oxidation-reaction of oxygen and iron and producing high heat *is localized in the center of the bath* away from the walls of the vessel.

As relates to the prior art reaction zone, the first two sentences of the Schwarz patent are pertinent:

> "If liquid baths, for instance metal baths, are to be treated with gases, it is important to bring the reactants

into as intimate contact with each other as possible. *Surface contact is not sufficient in most cases* to produce a rapid reaction, such as the blowing of the gas *over* the surface of the bath or the mere blowing of the gas *onto* the surface of the bath." (DX-5A p. 1, lines 1-7) (Emphasis added)

The localized reaction zone of Suess is located at the central surface of the bath, where the oxygen is blown vertically "through the slag layer onto and below the surface of the **[149]** bath at the central portion thereof." This not only preserves the refractories but promotes adequate phosphorus removal.

Dr. Chipman testified (PX-J-4 pp. 1016-1017) that in the prior art the injection of the jet deep into the bath produces an elongated oxidizing agent in the molten metal, and wherever that instrumentality contacts oxidizable materials, it produces oxidation reaction no matter how such a jet or jets are lengthened, and whether horizontally or partially horizontally layered, the hot region accompanies the entire circumferential length as the instrumentality comes into contact with the bath material. Under the prior art, then, the reaction area or zone was unlimited and unconfined, i.e. not "localized".

The obvious significance of the Suess process lies in the understanding, particularly by one skilled in the art of steelmaking, that the oxygen jet in Suess creates an oxygen to metal contact area in a critically confined and localized zone at the central surface of the bath. Thus the Suess specification teaches the creation of a hot spot by impingement of the oxygen to create a locale of oxygen-metal reaction at the central surface of the bath, in contra-distinction to the prior art which provides for a dissemination of oxygen **[150]** throughout the bath. In the prior art high temperature was caused indiscriminately wherever the oxidation process occurred within the interior of the bath; in the case of Suess, high temperature is controlled and limited to a

very restricted reaction zone at the central surface of the bath.

It seems that this understanding of the technical difference may not have been properly clarified in the prior Courts, because the term "hot spot" which is used to describe reactive areas was indiscriminately employed in both the prior art and Suess. This contributed to the District Courts finding that:

> "The 'localized reaction zone spaced a substantial distance from the refractory lining' and the 'high temperature' in such reaction zone are features of the claims which this Court considers anticipated by the Schwarz and Miles patents and therefore certainly obvious to persons skilled in the art." (257 F.Supp. at page 404).

The difficulty with this thinking is first, that the "localized reaction zone" of the Suess specification is being removed from its "localization" at the central surface of the bath and equated with the Schwarz-Miles reaction areas throughout the bath; and second, that neither Schwarz nor Miles produced successful results so far as the refining of pig iron into **[151]** steel by oxygen was concerned.

We must therefore examine the relevant portions of the Suess specification for the purpose of determining whether there is any difference in the placement of the reaction center and the reasons therefor as distinguished from the prior art. Such demonstrations are numerous:

> ". . . portions of the unrefined metal are continuously presented to a *localized center* of direct oxygen reaction with the bath metal . . ." (col. 4, lines 34-36) (Emphasis added)
>
> ". . . develops extremely high temperatures in the *zone of direct oxygen contact* with the molten metal . . ." (col. 4, lines 50-52) (Emphasis added)
>
> "The ensuing reaction of carbon with the FeO and directly with the oxygen gas *in the confined direct oxi-*

dation zone causes rapid formation . . .'' (col. 4, lines 60-62) (Emphasis added)

". . . which augments the bath circulation to continuously present unrefined metal to the *oxygen gas reaction zone* . . .'' (col. 4, lines 64-66) (Emphasis added)

". . . thus effectively encompasses the *zone of direct oxygen reaction* . . .'' (col. 5, lines 2-3) (Emphasis added)

". . . it is a characteristic of the process of the invention that in the *confined zone of direct oxygen reaction at the surface* of the molten metal bath, the oxidation products . . .'' (col. 5, lines 60-63) (Emphasis added)

[152] ". . . the iron oxide reacts with the carbon present in the bath, primarily *outside of the direct oxygen-metal reaction zone* . . .'' (col. 5, lines 67-69) (Emphasis added)

''An equal amount of heat is absorbed *outside of the confined central zone of direct oxidation* as the FeO (as silicate) is reduced by the carbon in the bath . . .'' (col. 5, line 75 to col. 6, lines 1-2) (Emphasis added)

". . . with the induced circulation of the bath metal toward and away from the *central zone of direct oxygen reaction* . . .'' (col. 6, lines 63-65) (Emphasis added)

". . . it is characteristic of this oxygen steel making process that the high temperatures developed in the *reaction zone between the bath metal and the slag* cause . . .'' (col. 7, lines 29-32) (Emphasis added)

". . . the *contact of the oxygen with the bath* resulting in reaction of the oxygen with a portion of the iron and with the oxidizable impurities of the bath in a localized reaction zone . . .'' (col. 12, lines 16-19) (Emphasis added)

That the *reaction zone is localized at the surface* is indicated by the various references in the specification relating to the impingement of the oxygen jet *on the surface* by *vertical* and central blowing:

". . . with a high purity oxygen jet impinging *vertically* or *approximately vertically* on the *melt surface* substantially at the *central portion thereof* . . .'' (col. 3, lines 18-20) (Emphasis added)

[153]

''In so operating, the area of jet impingement is controlled to produce *a relatively confined zone of direct oxygen to molten metal contact* with respect to the total *surface area* of the bath.'' (col. 3, lines 46-49) (Emphasis added)

''This vigorous boiling action is opposed by the pressure of the oxygen jet *only in the area of impingement, and outside of this area* it represents primarily endothermic reduction of FeO by carbon to form the evolved carbon monoxide, which reaction thus effectively encompasses the *zone of direct oxygen reaction* at which the highest temperatures prevail affording a maximum measure of protection to the refractory lining of the refining vessel.'' (col. 4, lines 72-75 to col. 5 lines 1-5) (Emphasis added)

". . . and is *confined to an impingement area at the central portion of the bath surface.*'' (col. 4, lines 71-72) (Emphasis added)

". . . high oxygen efficiency is obtainable acording to the the process of the invention when the oxygen jet *impinges on the central portion of the molten bath surface* from directly above, that is, approximately *vertically.*'' (col. 5, lines 30-34) (Emphasis added)

''The turbulence of the bath and slag due to the oxygen stream *impinging from directly above* is insufficient to cause continuance of oxygen metal reaction.'' (col. 6, lines 69-72) (Emphasis added)

And as to both localized reaction zone and impingement, the following.

". . . the *impingement area* of the high purity oxygen on the *central portion* of the bath isolates [154] the refractory walls of the refining vessel from the extremely high temperatures which are developed by the *direct reaction* of the oxygen and and the molten metal.'' (col. 4, lines 1-6) (Emphasis added)

That the reaction zone is not deep is reflected in the descriptive words as follows:

> "According to the process of the invention . . . [certain matters are prescribed] such that direct contact of the oxygen jet and the molten metal is established and maintained throughout the refining period *without deep penetration* of the molten metal bath by the jet." (col. 3, lines 36-46) (Emphasis added)
>
> "The process conducted under these conditions *avoids a deep penetration* of the oxygen gas into the molten bath . . ." (col. 3, lines 73-75) (Emphasis added)
>
> "The oxygen jet thus contacts the emulsion of bath and slag components which presents a larger reaction surface and causes the refining reactions to progress rapidly *although the oxygen jet does not penetrate deeply* into the molten metal bath and *is* confined *to an impingement area at the central portion of the bath surface.*" (col. 4, lines 67-72) (Emphasis added)
>
> "*Under these conditions, deep penetration of the molten metal both is avoided, while the necessary displacement of the slag cover to main direct oxygen to molten metal contact is insured.* (col. 9, lines 17-20) (Emphasis added)

From the instructions as a whole it may be seen that the patentees are presenting the idea of an oxygen jet impinging vertically on the central surface area of the molten bath and **[155]** in this way confining and localizing the center of oxygen to metal contact area or zone for the generation of high temperature of oxidation-reaction. By so doing the operator may control the chemistry involved in the process. That it is a surface center or zone seems to be emphasized by the fact that the word "surface" is used approximately 30 times throughout the Suess patent.

The specification also finds support in the testimony of the experts.

When asked about the process's placement of the "hot spot" which contained the high temperatures, Dr. Chipman replied (PX-J-3 pp. 441-441A):

> "A. The hot spot is generated at a point as far from the refractory as one can get in the vessel; namely, with respect to the surface area of the bath, it is at the center, which gives you the maximum distance from the side wall.
>
> With respect to height or depth in the bath, the hot spot must be held reasonably near to the surface of the bath so that it does not extend deeply into the bath to sufficient depth to damage the bottom refractory . . . two principal areas from which the heat zone must be held far enough to avoid undue damage . . . are the *periphery* of the bath where the bath and side wall come into contact and the *bottom* of the vessel immediately under the hot spot." (Emphasis added)

[156] But that was not the only reason why the hot spot was localized in such a position, because, as he testified, if the high temperature was spread over a wider area of the surface the dissipation of heat necessary to create circulation would diminish "the chemical force which sets the bath into motion." In addition, this location is essential for providing iron oxide for the slag, which is essential for phosphorous control. (PX-J-3 pp. 442-443) If the jet is embedded or blown deeply into the bath, it not only destroys the refractories, but also hampers the chemical refining operations involved in the process. As related to the hot spot, Dr. Chipman in answer to questions stated (PX-J-4 pp. 1016-1017):

> "Q. . . . Now do I understand from this that the hot spot develops at the bottom of the cavity made by the penetrating jet?
>
> A. All over the cavity.
>
> Q. And that occurs without regard to the depth of the cavity?
>
> A. Yes. The hot spot develops all over the cavity without regard to the depth."

He also stated in answer to questions (PX-J-4 p. 1017):

"Q. I take it that the hot spot that you speak of there develops all over the cavity when you practice the teachings of Schwarz; is that so, Doctor?

A. I think so.

[157] Q. You can't avoid it, can you?

A. I don't think you can avoid it.

Q. And it happens when you practice the teaching of Miles?

A. Blowing oxygen onto and into the bath, you can't avoid the high temperatures."

It was unfortunate that the word "spot" was used in this particular testimony and not "region" or "area" to differentiate the Miles-Schwarz "area" from the "zone" in Suess.

For example Dr. Elliott testified (PX-J-19 pp. 6061-6062):

"The oxygen jet is to be operated to generate a localized high temperature reaction zone—that is the hot spot—which is confined to the upper central portion of the bath . . ."

Also, a little further

"The patent is very explicit in this regard, that the oxygen, when it is blown onto and just below the surface of this bath, can react to oxidize such things as iron, silicon, phosphorus, manganese, and in this it generates an enormous amount of heat, it reacts with carbon, it generates both heat and gas, and there results a very high temperature, and this high temperature region is confined to the area of impingement."

Dr. Elliott also testified (PX-J-19 pp. 6064-6065):

". . . this teaches the presence of the confined central region which is at a high temperature because of the reactions. It teaches that one must confine this region in order to protect the refractories . . . [a]nd [158] to obtain control of the chemical reactions in the process."

Dr. Elliott further explained what happens to the "hot spot" when it is extended to deeply into the bath (PX-J-19 pp. 6072-6074):

"(By Mr. John Webb): What effect does the size of the localized reaction zone that you have been talking about have on the FeO content of the slag?

A. I'm talking in the first case primarily of the vertical extent of this reaction zone. If it is too deep into the metal, the oxygen goes to the metal without forming iron oxide or forming insufficient iron oxide . . .

THE COURT: You mean this hot spot extends too deep?

A. If the reaction zone extends too deeply——

THE COURT: Well, what is the difference?

A. Well, if it gets too deep, it may not be the hot spot any more because of the effect of the bath on this.

THE COURT: Wait a minute. I thought you were talking about this localized reaction zone and the hot spot as one and the same thing.

A. If it is conducted properly, yes.

THE COURT: Well, state that again. See if I can understand it.

A. If the volume of engagement between the oxygen and the bath is too deeply imbedded in the bath, there will be difficulty getting iron oxide formed.

[159] THE COURT: You are saying if the oxygen jet becomes too deeply imbedded in the bath? Is that it?

A. Yes, sir.

THE COURT: Then what happens?

A. There will be insufficient iron oxide formed. This will prevent the slag from doing its work in removing phosphorus."

He also testified (PX-J-19 p. 6074) that phosphorus control is not the only indicator in the process. Others, he testified, were refractory wear, control of chemical reactions and

frothing of the slag, as exemplified by the following colloquy (PX-J-19 pp. 6074-6076):

> "THE COURT: . . . You are speaking here about the indicators of a proper localized reaction zone. This localized reaction zone is *one* of the essential elements of this patent.
>
> A. Yes.
>
> THE COURT: And the indicators of that, *one is excessive wear* of the refractory lining; is that right?
>
> A. Yes, sir.
>
> THE COURT: Another indicator, would you say, is improper or excessive foaming of the slag?
>
> A. May I suggest that we consider the prime subject as control of the chemical reactions, and the *foaming slag would be one* example of the indicators under this title.
>
> THE COURT: Chemical reaction doesn't mean **[160]** anything. I will put it down the way you say. The chemical reaction, and under that you have foaming slag.
>
> A. Slag condition, foamy slag, yes.
>
> THE COURT: And what else under that chemical reaction indicator?
>
> A. Phosphorus content of the bath." (Emphasis added)

Dr. Elliott on direct stated (PX-J-19 pp. 6080-6081):

> "Q. Now would you explain what they mean by the term 'fluid slag', how that enters into this discussion?
>
> A. Slags tend to be creamy in character, like a thick cream, when they are properly formed. If there is undissolved material in the slag like refractory material, little piece of refractory ever so small, the slag gets a consistency like partially melted ice cream.
>
> I am reminded of the residual that is left when my small children eat ice cream. They stir it around. Some of it is partially frozen and some of it is liquid, and it is a little bit lumpy and a little bit thick. This is what we call a—it is not a completely dissolved slag. The slag does not have all of its components in solution, and if there are various refractory materials being brought into the slag, such as magnesia, which is in the refractory, this tendency will be evident, lumpy and thick slag.
>
> On the other hand, in the other direction, if the slag has excessive amounts of iron oxide in it, it may well be watery, take on the consistency of kerosene, whereas one would look on, say, castor oil as more typically fluid. **[161]**
>
> Q. What would cause this excess of FeO in the slag that would give it this character that you discussed?
>
> A. This could conceivably result from the operator working with his lance too high so that, in fact, the reaction zone is not even located in the bath, that it is located in the slag. This would be an extreme case."

Dr. Elliott based his statement of the existence of the localized reaction zone on three points: (1) that he had conducted a series of laboratory experiments, which were both observed and photographed, and the temperature rose very rapidly as the oxygen was brought in contact with the bath, which indicated a very large release of heat from these reactions and that upon measurement the resulting temperature of this reaction zone was found to be 4000 to 5200 degrees Fahrenheit; (2) from the emergence of fume and dust from the mouth of the vessel and from the fact that in steelmaking operations this fume is always associated with very high temperatures, he concluded that there was a hot spot in the McLouth operations; and (3) by the Linz thermocouple test, which showed that when one of the thermocouples was located essentially directly under the area of impingement of the oxygen jet on the bath, a very rapid rise in temperature occurred **[162]** and the thermocouple was quickly destroyed. This indicated the existence of the hot reactive region at the oxygen-iron contact point. Other thermo-

couples located further away were not destroyed and their temperatures did not rise rapidly.

John Edward Prince testified in both *McLouth* and *J & L* (R.3643) that in the L-D process the direct reaction was at the surface and occurred in the indent. He said also that the reaction zone and the indent are substantially co-extensive. Mr. Felix Wallner testifying for the plaintiffs in these instant cases said (R. 1218-1219) that he conducted the Linz thermocouple tests; that the "zone of the bath with the higher temperatures is located below the oxygen jet as it impinges upon the surface of the bath."

The specification described "a low static pressure at the point of origin" for the blowing of the oxygen by the jet within certain limitations (col. 3, lines 52-64) in order to produce a "sufficiently high reaction velocity of the oxygen with the bath constituents" (col. 3, lines 63-65), "consistent with controlled temperature and control and development of other necessary and required process conditions, such as fluid slag, avoidance of over-oxidation (undue loss of iron to the slag), and avoidance of slopping. (col. 3, lines 68-72).

[163] In endeavoring to read the specification as would one skilled in the art of steelmaking, I conclude that this reference provides a highly abbreviated statement of the process. This impression seems to be strengthened by what the foremost expert of his time, Dr. Durrer wrote in the December 14, 1949 memorandum (DX-110-E J&L) (DX 89B(20)McL):

> "The good results consist in particular in the very low contents of carbon, phosphorous and sulfur, *which contradicts all metallurgical* expectations. This work shows a new metallurgy with which we must first of all become acquainted. Presumably, the extensive removal of these substances is *due to the higher temperature, the higher degree of liquidity, connected therewith and the higher reaction velocity resulting therefrom.*" (Emphasis added)

The Suess patentees promised a "sufficiently high reaction velocity of the oxygen with the bath constituents" (col. 3, lines 63-65), and that this provides and insures the "development of autogenous heat" sufficient for the "completion of the refining in a minimum of time, consistent with controlled temperature and control and development of . . . fluid slag, avoidance of over oxidation (undue loss of iron to the slag), and avoidance of slopping." (col. 3, lines 63-72) And this all comes about by the instructions preceding these statements "according to the process of the invention." (col. 3 **[164]** line 36). It will also be seen here that the "static pressure at the point of origin" in accordance with the limitations imposed by the foregoing instructions has some force at the place of impingement. However, the specification says that this "pressure of the oxygen jet" opposes the vigorous boiling action produced by the oxidation of the iron, silicon, manganese and other impurities and carbon as it "is confined to an impingement area at the central portion of the bath surface." (col. 4, lines 60-72).

This confined zone of impingement area has been identified by the experts on both sides as an "indent". For instance, when Dr. Hauttmann was asked a question, he made this answer (PX-J-8 p. 2400):

> "Q. Doctor, would you explain a little more in detail what you mean by the word 'indent'?
>
> A. This is the deformation of the surface in the part in which it is hit by the oxygen jet."

Dr. Elliott described it in this way (PX-J-20 pp. 6411-6412):

> "A. The 'localized reaction zone' in the claim is synonymous with the 'confined central reaction zone'. It is

also synonymous with the term 'relatively confined zone' where there is implicit in the statement of the sentence where that appears that there is a reaction going on.

[165] THE COURT: You say that the term 'localized reaction zone' in the claim has the same meaning as which terms used in the specification?

A. The 'confined central reaction zone.'

THE COURT: And anything else?

A. And the 'relatively confined zone' where they are speaking of a reaction going on. The sentence often indicates there is a reaction, and they speak of a 'relatively confined zone.'

THE COURT: Those two terms as used in the specification have the same meaning as the term 'localized reaction zone' in the claim?

A. That is correct."

Dr. Shapiro testified (PX-J-12 p. 3739) that the volume of the indent is controlled by the momentum force of the jet and has no defined or regular shape but can be supposed in a reasonable way to have a shape whose cross section is like a parabola. If the depth of the parabolic figure and its volume are known, the breadth of the indent can be reckoned and also the force as that force acting frictionally tangential is further projected to mechanically supply a proportionately high pound weight force of about 6.6 pounds (the pounds of force tangentially applied is equal to 350 pounds) to a melt of some 200,000 pounds weight. The Court asked how 6½ pounds can make a 12 inch indent, and Dr. Shapiro explained that the **[166]** force which makes the indent is not 6½ pounds but is about 350 pounds. The 6½ pounds is the total force applied tangentially to the surface. He stated that he proved in his demonstration that it is only the frictional force tangentially to the indent which can physically set the bath into motion. The downward force, which is 350 pounds in this

case can only produce an indent. It canot produce motion in the bath.

The word "indent" appears nowhere in the Suess patent. How and why then should it enter into any consideration here? I have already set forth circumstances that the jet controls the shape, extent and direction of the oxidation-reaction path. If the reaction zone of the Suess patent, as they describe it, is to be surface-oriented or surface-localized as the oxygen impinges upon and makes contact with the metal and contains the generating chemistry in iron refining, then we ought to know how it is done.

And this is so, I again repeat, even though the law does not require an inventor to know what the scientific principles are in his invention, but only that it works. *Standard Coil Products Co. Inc.* v. *General Electric Co.*, 306 F.2d 319, C.A. 2, 1962.

[166.1] It seems to me that the mechanical or physical action within the control of the operators meets its conclusion with the impingement of the oxygen jet upon the molten metal surface and that at that time—and place of impingement, there begins the chemical reaction over which the operator has no control, except through the physical and mechanical application. Here then is the key and critical part of the process which must sustain the patent's phenomenon, if it has any phenomenon at all. Here in the place of impingement on the surface at the center of the bath and at the place where the experts say an indent occurs, must be the answer to the success of the Suess patent as it discloses the failures of the prior art.

[167] **VIII. Substantial Distance**

Claim 1 of the Suess patent speaks of a localized reaction zone spaced "a *substantial distance* from the refractory lining." (col. 12, lines 19-20). Thus the *McLouth* rulings on localized reaction zone are intimately linked with the rulings on substantial distance.

The District Court held:

> "Indeed the Schwarz and Miles Patents which taught deep penetration also referred at least indirectly to the existence of such reaction zone a substantial distance from the refractory lining. (DX 61, Schwarz, pp. 4-5; Miles, pp. 3, 15, 16). Deep penetration of the bath by the oxygen jet as taught by Schwarz and Miles might well extend to a depth of two-thirds of the bath, for example, still leaving a 'substantial distance' of one-third of the bath depth between the reaction zone and the refractory lining. The term 'substantial distance' is not given any definite meaning by the patent in suit, and the patent certainly does not teach that one-third of the bath depth, for example, would not be a 'substantial distance' within the meaning of the claims." (257 F.Supp. at page 426).

The word "substantial" may not be one which lends itself to precise definition. But it gains significance from the context in which it is used.

In *Ewald* vs. *Commissioner of Internal Revenue,* 141 [168] F. 2d 750, 752 C.A. 6, 1944, Judge Hamilton said:

> "The word 'substantial' is susceptible of different meanings according to the circumstances of its use and is variously defined as actual, essential, material or fundamental."

In *Newark Stove Co.* v. *Gray & Dudley Co.,* 39 F. Supp. 992, 994 (D.C.M.D. Tenn. 1941) a patent was held to be infringed because the claim substantially involved patent principles. Judge Davies said:

> "And if we were to say that the law provides that, merely because a door in the furnace manufactured by the defendant is not as large and does not occupy the same space as called for in Claim 10 of the patent, yet, on the other hand, has all of the desirable features of the patent itself, the principle of the reflective radiation, particularly, I think we would be going far afield from the equitable application of the law regarding patents."

In *Steelton Borough's Election* case, 129 Pa. Super. 302, 307 (1937), where the term "substantial error" was included in a statute providing for the opening of any ballot box, it was held:

> "The word 'substantial' is susceptible to different meanings according to the circumstances."

The following references in the specification are indicative of central and surface placement of the oxygen jet:

> ". . . impinging vertically or approximately vertically on the melt *surface substantially* at the *central* portion portion thereof . . ." (col. 3, lines 18-20). (Emphasis added).
>
> ". . . the high purity oxygen jet is blown vertically, or approximately vertically upon the *central* portion of the *surface* of a bath of the molton metal . . ." (col. 3, lines 36-39). (Emphasis added).

[169] "In so operating, the area of jet impingement is controlled to produce *a relatively confined zone of direct oxygen to molten metal contact* with respect to the total *surface* area of the bath." (col. 3, lines 46-50). (Emphasis added).

> ". . . application of the oxygen jet *substantially* vertically or approximately vertically upon the *central* portion of the bath *surface* . . ." (col. 4, lines 28-30). (Emphasis added).
>
> ". . . when the oxygen jet impinges on the *central* portion of the molten bath *surface* from directly above, that is, approximately vertically." (col. 5, lines 31-34). (Emphasis added).
>
> ". . . it is a characteristic of the process of the invention that in the confined zone of direct oxygen reaction at the *surface* of the molten metal bath, . . ." (col. 5, lines 60-62). (Emphasis added).

It then adds:

> "The process conducted under these conditions avoids a deep penetration of the oxygen gas into the molten

bath which seriously impairs refractory life at the bottom of the refining vessel. In addition, the *impingement area* of the high purity oxygen on the *central portion of the bath* isolates the refractory walls of the refining vessel from the extremely high temperatures which are developed by the direct reaction of the oxygen and the molten metal." (col. 3, lines 72-75, to col. 4, lines 1-6). (Emphasis added).

"In carrying out the process of high purity oxygen refining of a molten bath of pig iron, the refining vessel is of such design and the charge is of such amount that the ratio of the depth of the molten bath in meters to the surface area of the molten bath in square meters should be from about 1 to 5 to about 1 to 28 in refining vessels of various design **[170]** or in terms of the ratio of depth to diameter of a circular bath between 1:2.5 and 1:19. In other metallurgical processes to which the present invention is adapted, substantially similar ratios may be used." (col. 4, lines 15-25).

"The oxygen jet thus *contacts the emulsion of bath and slag components* (interface) which presents a larger reaction surface and causes the refining reactions to progress rapidly, although the oxygen jet does not penetrate deeply into the molten metal bath and *is confined to an impingement area at the central portion of the bath surface.*" (col. 4, lines 67-72). (Emphasis added).

". . . (I)t is a characteristic of the process of the invention that in the *confined zone of direct oxygen reaction at the surface* of the molten metal bath, the oxidation products of the impurities in the pig iron, such as silicon and manganese, as well as the oxidized iron form an early fluid slag which is always very rich in oxides, that is, highly oxidizing." (col. 5, lines 60-66). (Emphasis added).

"Under these conditions, deep penetration of the molten metal bath is avoided, *while the necessary displacement of the slag cover to maintain direct oxygen to molten metal contact* is insured. However, in the unusual circumstances of an abnormally stiff slag cover, the blow may be initiated using mechanical means for penetrating the slag cover *to establish oxygen to metal contact.*" (col. 9, lines 17-24). (Emphasis added).

"However, it is a characteristic of this oxygen steel making process that the high temperatures developed *in the reaction zone between the bath metal and the slag* cause a rereduction of manganese from the slag into the bath . . ." (col. 7, lines 29-33). (Emphasis added).

This last reference is indicative of interface oxidation activity which obviously is at the surface of the molten metal bath.

[171] Without further detailing reference terms, the specification's broad explanations relating to the bath's "surface", oxygen jet "impingement", and reaction" zones and areas, in their varible or synonymous expressions—all, as a whole—picture oxygen jet nozzle placement centrally at the bath surface and at the furthermost spot away from the bottom and side walls of the vessel.

There is very little left to the imagination after these instructions are provided in the specification. First, we know that the oxygen jet is to impinge upon the bath surface at its central point, and by the simple method of geometry we can very easily ascertain the central point of a circular or other shaped area. Accordingly, this would confirm and support the wording "a substantial distance from the refractory lining" since the central point is not only a substantial distance but includes the farthest point from any of the lateral refractory walls. Since the oxygen has impinged upon the surface and caused a local reaction zone at the central surface, it is undoubtedly a substantial distance from the bottom. Accordingly, it is easily understood not to "extend to a depth of two-thirds of the bath, for example, still leaving 'a substantial distance' of one-third of the bath depth between the reaction zone and the refractory lining." (257 F. Supp. at p. 426). It is **[172]** centrally located at

a place where the oxygen jet pressure "in a range from about 5 to 25 atmospheres above normal atmospheric pressure" impinges "onto and below" the metal bath "surface". Actually, then, we need no experts to give meaning or significance to the references contained in the specification on the term "substantial distance" as used in the claim of the Suess patent.

Thus, the words of Claim 1 "in a localized reaction zone spaced a substantial distance from the refractory lining" take supports from two different sections: first, from Claim 1 itself which contains revealing explanations that the discharge of "a stream of oxygen (is to be) vertically downwardly through the slag layer onto and below the surface of the bath at the central portion thereof" (col. 12, lines 12-15). This identifies the discharge as having sufficient strength to pierce the slag and strike the surface of the bath superficially. This is then further explained by the words "the contact of the oxygen with the bath" (col. 12, lines 16-17, as this contact is limited in Claim 2 by reason of the fact that "the oxygen is blown into said vessel under pressure in a range between five and about twenty-five atmospheres above normal atmospheric pressure" (col. 12, lines 31-33). Secondly, the references just quoted from the specification give it specific supports and this is in accordance with law. *United States* v. *Adams*, 383 U.S. 39 (1966); *Ethyl Corp.* v. *Borden, Inc.*, 427 F. 2d 206, C.A. 3, 1970; *Schmidinger* v. *Welsh*, 383 F. 2d 455, C.A. 3, 1967, cert. den. 390 U.S. 946.

[173] The law of patents does not condemn the phraseology used here. A phrase used in connection with a process, described in a patent, is not a fatal defect for want of definiteness where the specification gives meaning to the phrase. *Sales Affiliates* v. *Hutzler Bros. Co.*, 71 F. Supp. 287 (D.C.Md. 1947), aff'd. 164 F. 2d 260, C.A. 4, 1947. It is not necessary to detail intricacies *ad absurdum* since the skill of the inquiring artisan must be taken into

account, and in addition where complexity dictates, broad terminology complies with the statute. *General Electric Co.* v. *Brenner*, 407 F. 2d 1258, 132 U.S. App. D.C. 323 (1968). It is the specification which must contain the necessary directions and instructions for teaching one skilled in the particular art, which relates to the subject matter of the patent, how to accomplish the results which are promised in the patent. *Application of Gay*, 309 F. 2d 769, C.C.P.A. 1962; *Hazeltine Research, Inc.* v. *Gage Electric Co., Inc.*, 271 F. 2d 218, C.A. 7, 1959. The specification of a patent need not explain every term and reference used if the meaning would be known to one skilled in the art. *General Electric Co.* v. *Brenner*, supra.

Thus, the term "substatial distance" in the phraseology of the claim "in a localized reaction zone spaced a substantial distance from the refractory lining" is given highly adequate **[174]** meaning by the specification of the patent in suit and the subject matter of the claims, as the maximum distance of the localized reaction zone from the bottom and wall refractory lining of the vessel.

[175]

IX. Onto and Below

The District Court Opinion contains the finding that the term "onto and below" contained in Claim 1, in the phraseology "discharging a stream of oxygen vertically downwardly through the slag layer onto and below the surface of the bath at the central portion thereof" (col. 12, lines 12-14) is overbroad because ". . . there is no reference anywhere in the specification to blowing 'below the surface', as claimed." (257 F.Supp. at page 438). The District Court Opinion reasons that col. 5, lines 61-62 which speak of the "confined zone of direct oxygen reaction at the surface of the molten metal bath", which would seem to preclude a claim of blowing below the surface, would also suggest that the word "below" would cover even a deep penetration of the bath by the oxygen stream "which

is certainly not taught by the specification." (257 F.Supp. at page 438)

In any event, it said "Blowing 'onto and below the surface' is certainly taught by the Schwarz and Miles patents". (257 F.Supp. at page 439), and that this was so in spite of the fact that the Opinion acknowledged that there existed "a practically negligible penetration" of the surface of the molten metal by the words "onto and below" we are aware of the fact that they are **[176]** both relative terms and their meaning is to be determined by the surrounding facts and circumstances. *Eibel Process Co.* v. *Minnesota & Ontario Paper Co.*, 261 U.S. 45, 65-66 (1923). But more significant is the fact that both words appear in combination, so that to hold that one word "below" would seem to cover even deep penetration of the bath by the oxygen stream is at once an exclusion of the other component word "upon" as they are together read in connection with the words "surface of the bath". Thus, the word "upon" the surface, of necessity, excludes the idea of deep penetration by the oxygen jet. Furthermore, it would directly contradict the words contained in the specification generally which direct that the oxygen be caused to impinge upon the metal surface so as to make contact of oxygen with metal and as such process "avoids deep penetration" or functions in a certain way "although" the oxygen jet does not penetrate deeply into the bath. In other words, it would be inconsistent to here read the word "below" within the meaning of the specification itself as covering "even deep penetration of the bath by the oxygen stream." "Onto and below" combined as they are, survive a too strict interpretation as placed on the term by the District Court Opinion, because **[177]** such phraseology finds foundation in the patent terminology as a whole. *Long Mfg. Co. Inc.*, v. *Holliday,* 246 F.2d 95 (C.A. 4, 1957) *Autogiro Co. of America* v. *U.S.* 384 F.2d 391 (U.S.C.C. 1967)

In truth a patent should not be struck down or its claims necessarily limited where a reasonable construction of the specifications and claims will protect the inventor, *Corning Glass Works* v. *Anchor Hocking Glass Corporation, supra,* and has meaning to one skilled in the art of steelmaking. *Loom Co.* v. *Higgins,* 105 U.S. 580 (1882); *Carnegie Steel* v. *Cambria Iron* 185 U.S. 403 (1902).

If the word "below" had been used here alone, the interpretation contained in the District Court Opinion would be correct. But when the word "below" is used conjointly with "onto", then this connotation affects the meaning of both words. Accordingly, it is proper to apply to this context the maxim noscitur a sociis (it is known from its associates).

> "It is an ancient and well-known maxim, that is frequently applied and summarizes the rule both of language and of law. It is sometimes referred to as a legal doctrine; a rule of canon of construction, and it is applicable to all written instruments. The rule or maxim is to the effect that the meaning of a doubtful word may be ascertained by reference **[178]** to the meaning of words associated with it. Under this rule of *noscitur a sociis,* general and specific words, capable of analygous meaning, when used together, take color from each other, so that general words are restricted to a sense analogous to the less general, and the meaning of the word may be enlarged or restrained by reference to the object of the whole clause in which it is used." Corpus Juris Secondum, Vol. 66. page 607. See also: *Northway Village No. 3 Inc.* v. *Northway Properties Inc.* 244 A. 2d 47, 50, 430 Pa. 499 (1960); *Smedley Co.* v. *Employers Mutual Liability Ins. Co. of Wis.,* 123 A.2d 755, 758, 143 Conn. 510 (1956)

Under this rule, words capable of analogous meaning, when associated together, take color from each other and from the context in which they are used. I have no doubt whatsoever that "onto" and "below" were intended to

modify each other and the technical subject matter of he claims.

Surface Indent

Second. As we examine the phraseology containing the words in the claim "downwardly through the slag layer onto and below the surface of the bath", we immediately understand that the oxygen jet must penetrate the slag, and then blow upon the metal surface itself and make contact with it even to the extent of going below or disturbing the linear surface—so long as **[179]** it is only "to an extent to avoid material agitation of the bath by the oxygen stream". (col. 12, lines 15-16) [31]

Mr. Justice Brown in *Toplif* v. *Toplif*, 145 U.S. 156, (1892) said at page 171:

> "The object of the patent law is to secure to inventors a monopoly of what they have actually invented or discovered, and it ought not to be defeated by a too strict and technical adherence to the letter of the statute, or by the application of artificial rules of interpretation."

From an examination of the patent decisions, it is obvious that legal scribners have for a long time past had their documents related, translated and questioned, but few ever attained such competence as to be able to eliminate the legal assaults which inevitably exposed defects, or would-be defects, not anticipated by the scribner. So that while patentees are required to define their inventions with such particularity that would-be infringers know the metes and bounds of the legal protection to which the patentee is entitled *Palmer* v. *U.S.*, 423 F.2d 316 (Ct. Cls. 1970), a patent should not be struck down where a reasonable construction of the claims and **[180]** specification will protect the invention. *Corning Glass Works* v. *Anchor*

[31] I discussed this earlier *at Compendium IV*.

Hocking Glass Corp. 374 F.2d 473, C.A. 3, 1967, C.D. 389 U.S. 826 S.Ct. 65, 19 L.Ed.2d 80.

What Judge McLaughlin said there, I believe, is apt here. At page 376:

> "The District Court held that the Corning patent is '• • • a basic and pioneering advance in glass and ceramic technology.' 253 F.Supp. 461 at 465. We believe that Dr. Stookey's discovery is, in every sense of the word, a 'pioneer'—'• • • a patent covering a function never before performed, a wholly novel device, or one of such novelty and importance as to mark a distinct step in the progress of the art, as distinguished from a mere improvement or perfection of what has gone before.' *Westinghouse* v. *Boyden Power Brake Co.*, 170 U.S. 538, at 561, 562, 18 S.Ct. 707, at 718, 42 L.Ed. 1136 (1898). Where the court is confronted with such a pioneer patent liberality becomes the keynote of construction requiring the court to give the patentee a wide breadth of protection in constructing the patent claims and specifications. *Sessions* v. *Romadka*, 145 U.S. 29, 12 S.Ct. 799, 36 L.Ed. 609 (1892); *Consolidated Window Glass Co.* v. *Window Glass Mach. Co.* 261 F. 362 (3 Cir. 1919), cert. den. 251 U.S. 558, 40 S.Ct. 179, 64 L.Ed. 413 (1920); *Etten* v. *Kauffman*, 121 F.2d 137 (3 Cir. 1941)."

Judge McLaughlin quoted (at page 478) from *Georgia-Pacific Corp.*, v. *U. S. Plywood Corp.*, 258 F.2d 124, C.A. 2, 1958, cert. den. 358 U.S. 884, (1958):

> "'On the other hand, patentable inventions cannot always be described in terms of exact measurements, **[181]** symbols and formulae, and the applicant necessarily must use the meager tools provided by language, tools which admittedly lack exactitude and precision. If the claims read in the light of the specifications, reasonably apprise those skilled in the art both of the utilization and scope of the invention, and if the language is as precise as the subject matter permits, the courts can demand no more.' 258 F.2d 124, at 136."

That the Suess patent specification did reasonably apprise those skilled in the art of the utilization and scope of the invention was not questioned by the District Court Opinion.

> "In sum, this Court finds that the specification of the patent in suit, despite certain indefiniteness and inaccuracies, nevertheless complies with Section 112 by disclosing the invention in sufficiently clear terms to enable steelmakers 'to make and use the same.' At least defendant has not sustained its burden of proving otherwise, especially in light of defendant's own testimony that persons skilled in the art could make satisfactory steel following the teachings of the example and that extrapolation to other heat sizes was a simple matter." (257 F.Supp. at 424).

The particular significance of the combined words "onto and below", when read in context with the specification, find considerable support throughout, as they relate to "surface blowing" and "oxygen jet impingement" on the melt surface (col. 2, lines 47-51, 51-52, 65-66; col. 3, lines 18-22, 47-49; col. 4, lines 43-48). These are not all but they are representative of the situation, and they **[182]** exemplify some necessary supports under law, which, inadvertently, probably because of a lack of specified knowledge for interpreting the scientific values involved, remained imperceptible to the District Court. In particular this would seem to be the case when the District Court asserted that "the teachings of the patent . . . admittedly implies some penetration by the jet (R. 854), at least sufficient penetration to avoid slopping as specifically taught at col. 3, lines 70-75." (257 F.Supp. at page 422). The reasoning in this instance related to disagreement with McLouth's contention that surface blowing, as taught by the Suess specification, was "fatally indefinite" in the specification as required by §112. This holding alone by the District Court, it would seem, would have been sufficient to fulfill the interpretation that "onto and below" had a specific meaning descriptive of surface breach.

To those skilled in the art of steelmaking it is understood that a collision of oxygen charged with a force of from about 5 to 25 atmospheres above normal pressure ordinarily bores through or perforates the slag and makes contact with the surface of the bath. Accordingly they may understand, too, **[183]** that the jet will strike the metal surface with some remnant of the force remaining. Whatever that remaining force may be, it serves to disturb the linearity of the bath surface, and exerts a net force sufficient to act upon the impinged body so as to actuate it into a movement in the direction of the force by which it is being impelled. Thus the oxygen jet impingement, as prescribed by Suess, will create some denting or hollowing on the surface—no matter how trivial. So that there is in some degree the creation of a concavity or denting which literally lies below the bath surface plane.

The experts for both the plaintiffs and the defendant seem to accept the idea that at the place of contact of the oxygen jet with the molten metal an indent is created. Dr. Hauttmann explained that (PX-J-8 p. 2381) by "onto and below the surface of the bath" "is meant that a depression, an indent, is caused by the oxygen jet." At another time he said (PX-J-8 p. 2400):

> "This is the deformation of the surface in the part in which it is hit by the oxygen jet."

Dr. Shapiro testified that (PX-J-12 pp. 3738-3739):

> "The volume of the indent is controlled by the momentum force of the jet . . . we do not know the precise shape of this indent . . . one can suppose in a reasonable way that the indent has a shape whose cross-section is something like a parabola . . ."

[184] The McLouth witness also refer to the indent into the bath surface as made by the oxygen jet's impingement, although Dr. Richard A. Flinn stated in this way (PX-J-21 p. 7000)

> ". . . the jet penetrated the bath, producing a cavity, and ignition took place."

James A. Nicholls spoke of it in this way (PX-J-27 p. 8977),

> "The net result is an increase in indent or penetration because of the combustion effect."

Thus the indenting or bending of the surface would literally support the word "below" the planar surface as contained in the claim, even if it stood alone and without the conjoining word "upon."

Chemical Combinations Breach the Surface Plane

Third. Even assuming that there was no physical breach of the planar surface of the molten metal bath, when the oxygen jet impinged upon it, or bent it, or indented it, it would not necessarily follow that there would be no chemical infiltration by a combination of the atoms present in the oxygen and in the iron bath, which would then naturally disturb the linearity of the bath surface.

Aside from the fact that one condition necessary for a speedy combination of oxygen and iron is the high temperature of the iron, a second condition is required which would seem **[185]** to be fulfilled by the Suess patent applicants use of the word "impinge." The letter reflects that the oxygen jet must strike the bath surface with a force. Websters Third New International Dictionary, 1971, page 1134 defines the word "impinge" as meaning "to strike or dash especially with a sharp collision."

The word "impingement" in the references of the specification connotes a striking of the oxygen jet against the iron bath resulting in the combination of iron and oxygen as observed by the ignition and propagation of a fume (col. 4, lines 45-54). The context of the specification in this regard therefore indicates that the oxygen blowing has a

chemically penetrating effect. However one interprets the word "penetrate," it must come within the context of the words "onto and below the surface of the bath." It would also at the same time give significance to the words "without deep penetration" (col. 3, line 46), "The process conducted under these conditions avoids a deep penetration . . ." (col. 3, lines 73-74), and "Under these conditions, deep penetration of the molten metal bath is avoided . . ." (col. 9, lines 17-18).

[186] I conclude that in the light of all the instructions contained in the specification as to oxygen pressure, nozzle placement, ratio of bath depth to surface area of molten metal, and of all other instructions contained in the specification, and in accordance with the examples contained there, that a person skilled in the art of steelmaking will understand how to project or discharge the oxygen jet onto and below the surface of the bath, and so produce the promised steel in limited time and economy, and without unduly damaging the refractory linings of the vessel. Accordingly, the wording "onto and below" will not misdirect him into blowing the oxygen deeply into the bath in accordance with the prior practice of Schwarz and Miles.

I conclude that when the words "onto and below" are used in combination as related to the surface of the molten metal bath, such words take color from each other and that neither the meaning of "high" nor of "deep" may be attributed to the terminology, because the combining word delimits such meanings from surface positions or locations.

Because the oxygen jet disturbs the linearity of the bath **[187]** surface when blown upon it by producing a concavity or indent, such blowing supports the wording of of the claim "onto and below," because the surface linearity is literally breached.

When chemical combinations result in the formation of molecules, such combinations occur because oxygen and

iron have inter-penetrated each other. So, again, the blowing onto and below the surface of the bath by an oxygen jet, literally breaches the planar surface in the area of chemical combination.

[188] X. Avoidance of Material Agitation

Up to this point I have elaborated with considerable detail on what I have concluded are the foundational circumstances of these cases as required by *Blonder-Tongue*. I have done this in an effort to provide sufficient clarification of subject matter, which otherwise might have been complicated or confusing and thus misguiding. And while all the issues raised by the parties have not yet been discussed, it will not be necessary, as I now conclude, to treat these at length.

The objections to the rulings of the District Court on avoidance of material agitation were actually multiple in character. These include the findings that the claims do not measure the invention (257 F.Supp. at page 434); that there is no causal connection between "avoidance of deep penetration" (which plaintiffs allegedly abandoned) and "avoidance of material agitation" (257 F.Supp. at pages 426, 431); that "avoidance of material agitation" is not used or defined in the specification of the patent in suit (257 F.Supp. at page 428); that there was no antecedent language in the specification to support the terminology "avoidance of material agitation" in the claims (257 F. Supp. at page 429); that there was no correlation between "avoidance of deep penetration" and "avoidance of material agitation" (257 F. Supp. at pages 430, 434); that the "concept of avoidance of material agitation of the **[189]** bath by the jet would not have been meaningful to persons skilled in the art at the time the invention was made" (257 F.Supp. at page 431); that "the claim step of avoidance of material agitation of the bath by the oxygen stream is not supported by the specification of the patent in suit except in a very limited and perhaps meaningless way, and could not have been a meaningful concept to persons skilled in the art at the time the invention was made" (257 F.Supp. at page 432); that "the concept of material agitation of the bath by the oxygen stream is purely fictional" (257 F.Supp. at page 432); that "it seems impossible that a deep penetration by the jet could overcome or even materially affect such circulation, so as to cause a material agitation by the oxygen stream" (257 F.Supp. at page 432); that there is "tangible evidence in the record tending to confirm the concept of material agitation by the oxygen stream is a fiction" (257 F.Supp. at page 433); that "the teaching of the specification to avoid deep penetration does not provide support for the language in the claims of the patent in suit 'to avoid material agitation of the bath by the oxygen stream' " (257 F.Supp. at page 434); that there was "an attempt to equate material agitation with deep penetration (257 F.Supp. at page 434); that "circulation cannot be both up and down in the center at the same time" (257 F.Supp. at page 435); that "the language in the claims concerning the avoidance of material agitation of the bath by **[190]** the oxygen stream," essential to novelty appears "to be mere surplusage in the claims" (257 F.Supp. at page 435); that "the real reason for the inclusion of language in the claims of the patent in suit concerning the avoidance of material agitation by the jet was the desire by the applicants to distinguish the prior art Miles patent, which expressly taught that the jet itself agitated the bath" (257 F.Supp. at page 435); that "in effect, the specification of the patent in suit presented a new theory of agitation caused by chemical reactions, and the claims referred to an avoidance of agitation by the jet to give the impression of an entirely new steelmaking process" (257 F.Supp. at page 435); and, that "even under the process as taught by Schwarz and Miles chemical reactions rather than the mechanical action of the jet must have been the actual cause of agitation . . ." and so "if Schwarz and Miles avoided material agitation of the bath by the oxygen stream even with deep blowing, then such avoidance of material agitation

by the oxygen stream cannot be considered a significant feature of the claims of the patent in suit" (257 F.Supp. at pages 435, 436). I shall discuss these generally.

Claim 1 speaks of "discharging a stream of oxygen vertically downwardly through the slag layer onto and below the surface of the bath at the central portion thereof, *to an extent to avoid material agitation of the bath by the oxygen* stream . . ." (Emphasis added) col. 12, lines 12-16). The word "agitation" appears only once in the claims and only once in **[191]** the specification. However, since it is incumbent upon us to give meaning to a word by examining the context of all the words with which they associate, *Northway Village No. 3, Inc.* v. *Northway Properties, Inc.*, 244 A.2d 47, 50, 430 Pa. 499 (1968), I conclude that the word "agitation" in the specification and the word "agitation" in Claim 1 are used in different senses.

In the specification it is used in a two-fold sense of first, a result of the rapid formation of carbon monoxide, and second, the result of activation or boiling augmenting the circulation already existing in the bath. As the word "agitation" is used in the specification, it is not used to designate the originating motion or action in the bath, but is itself a chemical result caused by "rapid formation of carbon monoxide" which causes the agitation of the bath. It is synonomously identified as "a strong boil," which augments the bath circulation to continuously present unrefined metal to the oxygen gas reaction zone. (Col. 4, lines 60-66). Thus the word "agitation" finds itself involved and identified with chemical action or "circulation" caused by the chemical reaction originating in a localized reaction zone at the place of the impingement of the oxygen with the metal (Col. 4, lines 26-75, col. 5, lines 1-5).

However, the word "agitation" contained in the claim is used in a causative sense, directing the functioning of the operator of the oxygen jet as a physical matter; and yet it is not an instruction of how to make the Suess process

functional, **[192]** but rather how not to interfere with its functioning as is taught in the prior art. It is very much like the instructions contained in the four places in the specification where it is stated that if the process is employed and the instructions are followed, avoidance of deep penetration results. Thus in the claim it is used in the sense of forestalling, by measures prescribed in advance, a possible interception or interference of the blowing of the oxygen downwardly through the slag layer onto and below the surface of the bath producing an unwanted physical stirring action in the bath. The reason for the admonition of blowing "to an extent to avoid material agitation of the bath by the oxygen stream" was derived from the processes of Schwarz, Miles and the work at Gerlafingen. Since we already know Gerlafingen experimented on the Schwarz patent instructions, we look only at Schwarz and Miles.

Both Schwarz and Miles advocated the introduction of the oxidizing agent or "heat-generating" elements into the interview of the bath. Both Schwarz and Miles require the chemical action to occur deeply within the bath. Schwarz instructs that in order "to cause the jet of gas to act within the liquid baths . . ." (DX5A, page 2 lines 11-12), the jet is to be directed "with such a high kinetic energy that it is capable of penetrating in the manner of a solid body deep into the bath by the use of extremely high velocities lying preferably above the speed of sound." (DX5A, page 2, lines 5-9). Miles evidently **[193]** attempted to improve upon Schwarz, but like Schwarz maintained that a high speed jet would be required to provide "optimum penetration . . . within the bath" (DX10A, page 3, lines 11-13, lines 17-19), suggested "the use of a liquid instead of a gas for the jet [because] the liquid has a greater force of penetration into the metal . . ." (DX10A, page 2, lines 13-16). And although Miles suggested using a liquid jet for greater penetration of the bath, Schwarz was not much different because he had also attempted to achieve the

same thing by inserting the jet with "such a high kinetic energy that it is capable of penetrating deep, in the manner of a solid body, into the liquid bath" (DX5A, page 5, lines 23-25, page 6, line 1).

Schwarz maintained that the danger of rapid wear of the container lining was eliminated because "local overheating and accumulation of ferrous oxide, takes place in the center of the steel bath and therefore the walls of the vessel are not substantially attacked." (DX5A, page 4, lines 24-25, page 5, lines 1-2). Miles said, "The high speed of the fluid jet has the effect that the source of chemical oxidation reaction is located within the bath . . ." (DX10A, page 3, lines 17-18). Schwarz said that by its method, it is possible . . . to cause the jet of gas to act within the liquid baths . . . (DX5A, page 2, lines 9-12). Miles said, "The fact that the reactions take place in the interior of the bath assures the use of the developed heat to the maximum degree." (DX10A, page 4, lines **[194]** 1-2).

Basically, then, both Miles and Schwarz sought to confine the chemical reaction resulting from the contact of the oxygen (and fuel) with the oxidizable matter in the molten bath and the high temperatures caused by such oxidation reaction within the interior of the bath (DX5A, page 4, lines 22-25, page 5, line 1; Miles, DX10A, page 3, lines 17-19).

Neither Schwarz nor Miles prevailed upon any operator of their processes to apply the jet vertically and at the center of the bath, but rather indicated an oblique application of the jet, or as in the case of Miles, by the use of a number of jets and "given a vibrating motion so as to cover a larger surface of the bath."[32] Development of

[32] This is altogether different from Seuss, which prescribes a "controlled" area of jet impingement "to produce a relatively confined zone of direct oxygen to molten metal contact with respect to the total surface area of the bath." (Col. 3, lines 46-49).

wide vari-shaped, uncontrolled areas for the high temperature oxidation reaction prevailed, not in concentrated form but wherever the jet struck and penetrated. While the aim of both Schwarz and Miles was to cause chemical reaction deeply within the interior of the bath, their instructions on the whole were not so directed. Nevertheless, the aims of both were to physically aid the frution of chemical actions. Although Schwarz did not say so, Miles did say that, "The penetration of the jet also fulfills the useful function of agitating the bath . . ." (DX10A, page 4, lines 4-6); **[195]** "The jet serves to maintain a vigorous agitation so that the oxidizing reactions follow . . ." (DX10A, page 10, lines 5-8); "The high speed jet causes a vigorous agitation . . ." (DX-10A, page 13, lines 11-13; and, "The jet serves to circulate and agitate the metal and the slag . . ." (DX-10A, page 18, lines 8-11).

No matter how good the intentions of both Schwarz and Miles to confine the oxidation reaction and the high temperatures *within* the interior of the bath, we have already learned (VII, Localized Reaction Zone, pages 144-166), that oxidation reaction will occur wherever the oxygen strikes or comes in collision (impingement in the Suess patent) with oxidizable matters in the bath, such as iron, silicon, manganese, carbon and other impurities and that chemical combination will occur there with the result of ignition and the formation of high temperatures. Furthermore, we have seen that if the oxygen jet is elongated, the oxidation reaction will occur, as in the case of deep penetration, from the place the oxygen strikes the surface down circumferentially about the jet to the deepest portion of the penetration, or as we have also learned in the depth of the indent. From this we may logically conclude that it would have been impossible for either Schwarz or Miles to have been capable of delimiting—localizing—the oxidation reaction within the interior of the bath.

The prior art taught that the physical application of the jet provided agitation or stirring action within the interior

of the bath in order to bring about chemical results. But the prior art failed in its aims and purposes of producing industrial steel, and at the same time failed to preserve the refractory [196] lining. The new art discovered what it believed was a scientific revelation which could be interferred with if the teachings of the prior art were permitted to apply. Thus it became the duty of the new art to differentiate any of the interferring or hindering factors of the prior art. *Flexwood Company* v. *Saussner & Co.*, 145 F.2d 528, C.A. 7, 1944.

The *McLouth* District Court found that "avoidance of deep penetration" could not be equated with "avoidance of material agitation" by its reasoning that in the first instance "avoidance of deep penetration" did not appear in the claims, and in the second instance that the phraseology "avoidance of material agitation" did not appear in the specification "in so many words." Because of its prior conclusion that avoidance of deep penetration was the gist of the invention, the *McLouth* District Court was demanding that either the literal words "avoidance of deep penetration" appear in the claim or, that the literal words "avoidance of material agitation" appear in the specification; and failing such appearances no amount of instructive and explanatory wording in the specification could compensate for the omissions.

However, assuming that such a finding was correct on the bare conclusion that no causal connection was shown "in so many words" (although as we have seen, there is an abundance of other words which do show causal connection, synonymity and partial interchangeability in the specification), it would seem inappropriate to upgrade judicial pronouncement over the special [197] expertise [33] of the

[33] The primary examiner had received a law degree, majored in electrical engineering and minored in chemistry. He had been employed by the General Electric Co. from 1924 to 1927 and had been in the patent office from January 1927. He became the primary